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JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XXXVI. 1910.

PART I.

THE ADAPTATION OF THE PLANT TO THE SOIL. (I.)

By A. D. HALL, M.A., F.R.S.

[Being the third Masters Lecture, delivered February 22, 1910.]

THE subject which I have chosen for the two "Masters Lectures" which I shall have the honour of delivering before you is the adaptation of the plant to the soil, and by that ambiguous title I mean somewhat as follows: In Nature we are always finding plants that possess a very restricted range, being confined entirely to one limited piece of country, such as a mountain range, or even a particular rock area in that range, from which they do not stray into the neighbouring country. In the same way we find that certain plants will grow very well in some gardens, but fail entirely in others. In many cases we can see that those successes or failures are not due to climate in its wide sense, but depend upon the character of the soil. What I wish to discuss in these lectures is the nature of the factors which we can suppose to be in operation. I have chosen this subject partly for its intrinsic interest, as opening up some of the most fundamental questions of plant nutrition; partly for its practical importance to the gardener; but also because the experimental work which I am going to take as a text occupied for some time the attention of that distinguished botanist, the late Dr. Masters, in whose honour these lectures were founded.

At the experimental station at Rothamsted a piece of old grassland was in 1856 divided into plots, to each of which a different manure was applied. The land was afterwards cut for hay, as it has been every year since, and during the whole of the half-century that has elapsed since the experiment began the same kind of manure has been applied year by year to the same plot. Early in the history

of the experiment it became apparent that the manure was not only affecting the weight of hay obtained, but also the character of the vegetation. Accordingly what we may call botanical analyses were made of the vegetation on each of the plots. When the hay was cut a careful sample was taken that would fairly represent the bulk; it was then brought down to the laboratory, picked apart plant by plant, and sorted into heaps, each of which represented a separate species. The heap for each species thus obtained was then weighed, so that

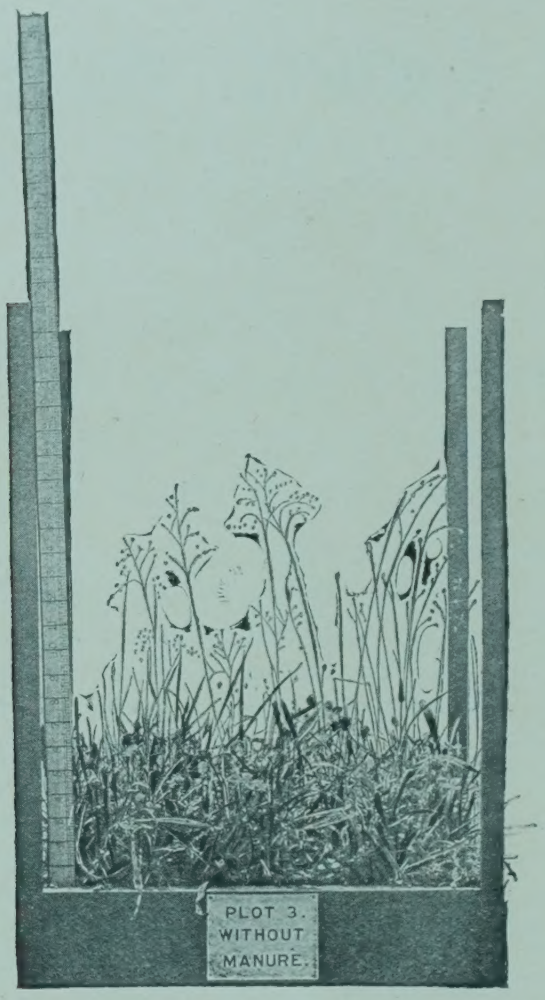


FIG. 1.—TURF FROM THE PLOT WITHOUT MANURE FOR FORTY-EIGHT YEARS. Herbage short, showing a great variety of species. *Briza media* the most prominent grass.

in the end a percentage table was obtained showing the proportion by weight which each grass or clover or weed contributed to the herbage of the plot. Dr. Masters was invited to co-operate in the study of this field from the botanical side. He spent a good deal of time at Rothamsted in the years 1877-80, and eventually co-operated with Lawes and Gilbert in an extensive paper, which appeared in the "Philosophical Transactions" in 1880.

The changes which had been effected by the different manures are still more manifest to-day after the treatment has been persisted in for

more than half a century, and the photographs (figs. 1-4) of samples of turf taken from the different plots will show how the vegetation has been revolutionized by the different systems of manuring adopted. At the same time, the diagrams (figs. 5-7) also serve to show how greatly particular species are encouraged by some of the manures, whereas other species are depressed and driven off the plots altogether.

Here, then, are examples of distinctive floras (and in early June the plots look as though they belonged to different parts of the

FIG. 2.—TURF FROM THE PLOT WHICH HAS RECEIVED PHOSPHATES AND POTASH, BUT NO NITROGEN.

Clovers, *Lathyrus*, and other leguminous plants constitute half the herbage.

country) that have been brought about by artificial means. The factors concerned are all on record and may fairly be expected to disclose the causes which have led to the redistribution of the herbage. In certain cases the explanation seems obvious enough; for example, we can see why the manure containing phosphates and potash but no nitrogen should encourage the leguminous plants until they become a good half of the herbage. Such leguminous plants can draw the nitrogen they require from the atmosphere by the aid of the bacteria present in the nodules of their roots. In consequence a mixture of

phosphates and potash forms a complete manure for such plants, whereas it is lacking in the nitrogen which the grasses specially require. The manure, in consequence, favours the leguminous plants growing in competition with the grasses, until they become the dominant species of the plot. Similarly we can understand why certain shallow-rooting grasses like 'sheep's fescue,' 'bent grass,' and 'sweet vernal' become dominant on the plots receiving ammonium salts. They are all grasses possessing a shallow root-system, and it is

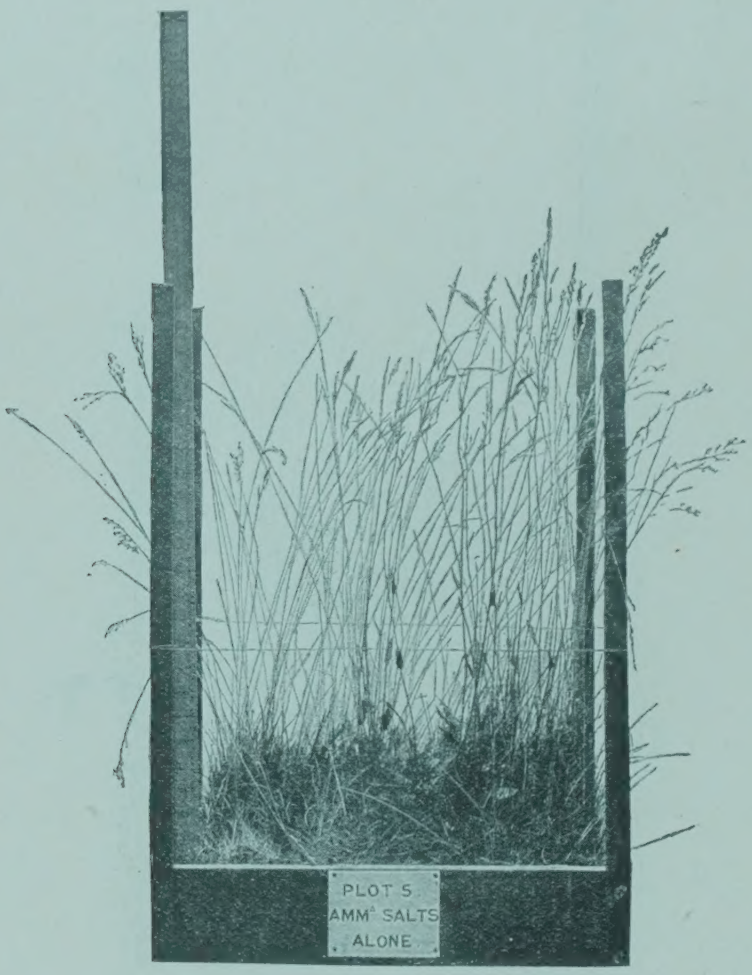


FIG. 3.—TURF FROM THE PLOT RECEIVING ONLY NITROGEN IN THE FORM OF AMMONIUM SALTS.

Vegetation wholly grasses, among which *Festuca ovina* is the most prominent.

characteristic of the ammoniacal manures to be caught up and retained by the surface layer of the soil. Such plants as have their roots in this surface layer are therefore most benefited by the manure and get an advantage in the competition that is always going on in the piece of grass land. On the other hand, when nitrate of soda is a source of nitrogen, the manure washes deep into the subsoil, with the result that such grasses and other plants which possess a deep tap-root derive the chief benefit from the manure. We can see reasons for one

or two other cases of association; for example, the sorrel (*Rumex Acetosa*) is abundant on all plots which receive potash and have their soil in an acid condition. This we can associate with the fact that the sap of the sorrel plant is strongly acid, and that the acid

FIG. 4.—TURF FROM THE PLOT RECEIVING A COMPLETE MANURE CONTAINING LARGE QUANTITIES OF NITROGEN, PHOSPHATES AND POTASH.
No weeds.

consists of a compound of potash, the acid oxalate. There are, however, many more problems than answers to be found in these plots. For example, why does the grass *Briza media* and the Rosaceous plant "Burnet" turn up on the unmanured plots, and there only? Why is the umbelliferous plant *Anthriscus sylvestris* abundant on plots receiving nitrate of soda, whereas in Nature it only occurs in hedge-

rows or under the shade of trees? Many similar questions can be asked but we are very far from being in a position to supply the answers.

With such positive results before us of the association of particular plants with differences in the chemical treatment of the soil it would seem not unreasonable to expect that an analysis of a plant and of the

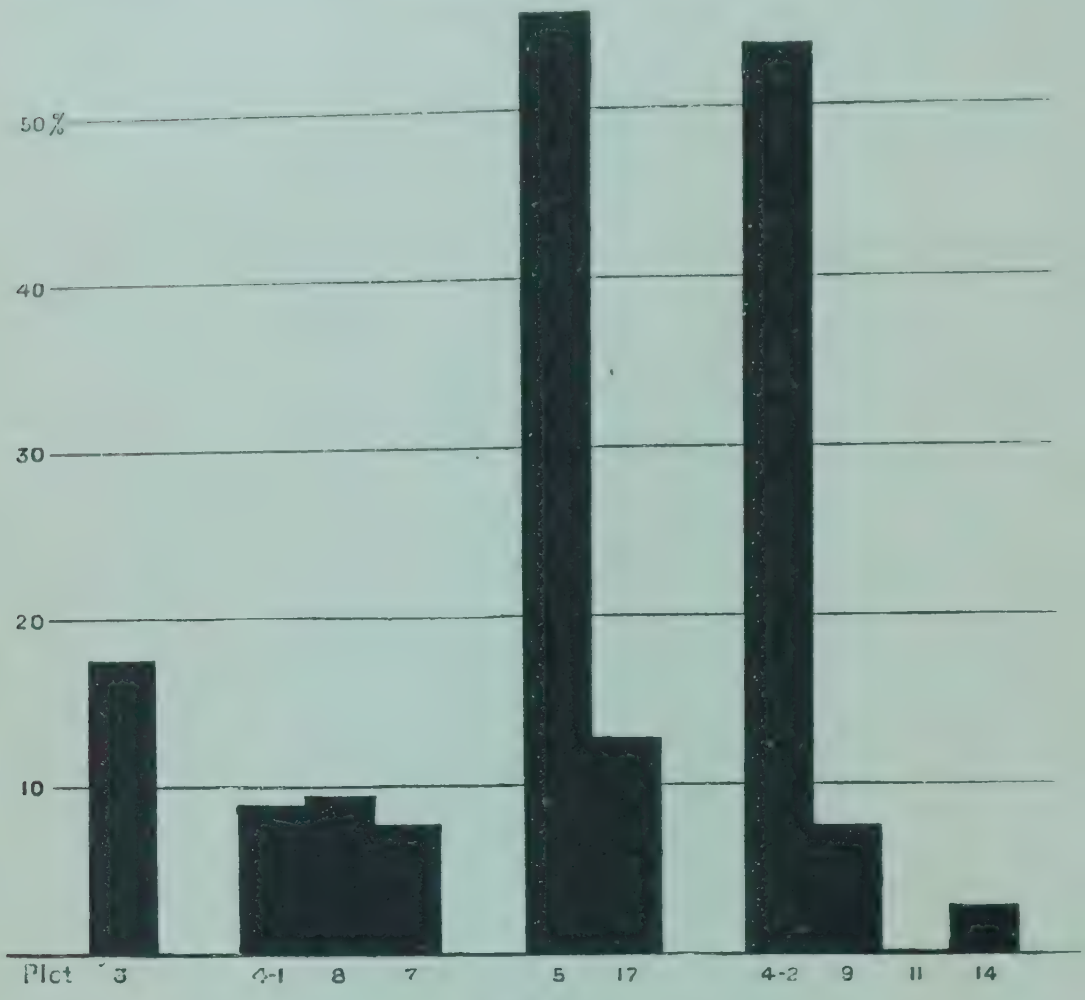


FIG. 5.

The vertical columns show the percentage of *Festuca ovina* in the herbage of the plots numbered below, the manuring of which was as follows :—

Plot 3.—Unmanured.
Plot 4-1.—Superphosphate only.
Plot 8.—Superphosphate, Magnesia, and Soda; no Potash.
Plot 7.—Superphosphate, Magnesia, Soda, and Potash.
Plot 5.—Nitrogen only as Ammonium Salts.
Plot 17.—Nitrogen only as Nitrate of Soda.
Plot 4-2.—Ammonium Salts and Superphosphate; no Potash.
Plot 9.—Complete manure, Nitrogen as Ammonium Salts.
Plot 11.—Complete manure, Nitrogen as Ammonium Salts in excess.
Plot 14.—Complete manure, Nitrogen as Nitrate of Soda.

soil in which it usually grows might reveal the presence in both of some common substance which accounts for their association. An analyst, indeed, is not infrequently asked to examine a particular soil and determine what is lacking in order to fit it for the growth of this or that plant. As soon as that is attempted, however, certain difficul-

ties become apparent. In the first place, all plants show much the same composition as regards the substances they derive from the soil; if we ignore the carbon which a plant obtains from the atmosphere the other elements present are restricted in number and are identical in all plants.

Table I. will illustrate the fact that variations in the composition of the ash of the same plant grown under different circumstances

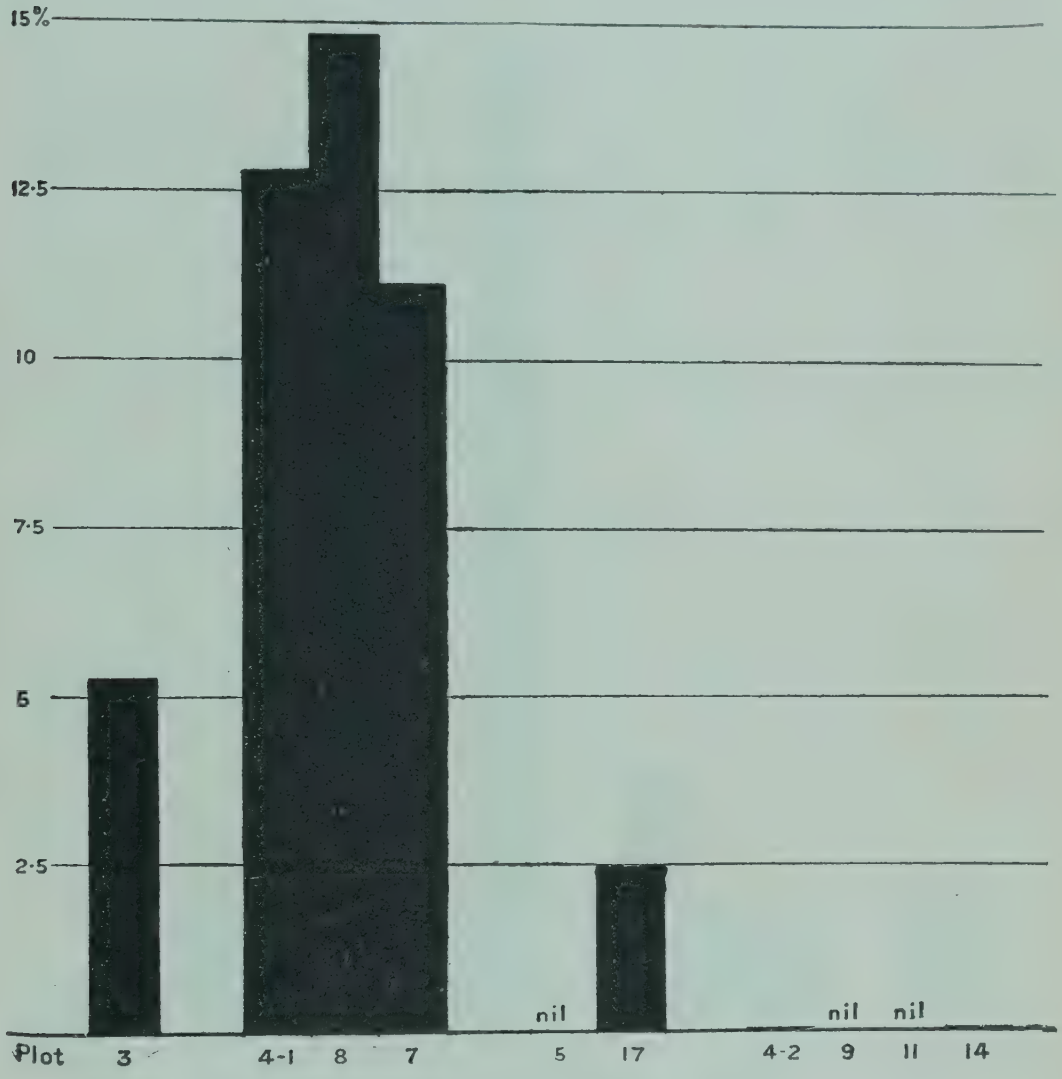


FIG. 6.—PERCENTAGE OF TRIFOLIUM REPENS, T. PRATENSE, AND LOTUS CORNICULATUS TAKEN TOGETHER.

For manuring, see fig. 5.

are of the same order as the differences in the composition of the ash of very distinct plants given in Table II. (see p. 9).

It has been the custom to draw distinctions between silica plants like cereals, the ash of which contains a good deal of silica, lime plants like clover, and potash plants like some of the root-crops; but these distinctions break down on experiment, for it is not found to be necessary or even beneficial to give any of these plants a special dose of its characteristic constituent.

Furthermore, if the analyses of all plants are very much alike, an even greater similarity is shown by soils. Table III. gives the chemical analyses of a number of soils, representing practically all the types met with in this country, except the true peats. The greater part of a soil consists of insoluble material which is of no service to the plant, but in the rest we always find small amounts of nitrogen, phosphoric acid, lime, magnesia, etc.; just the substances, in fact, that we find in

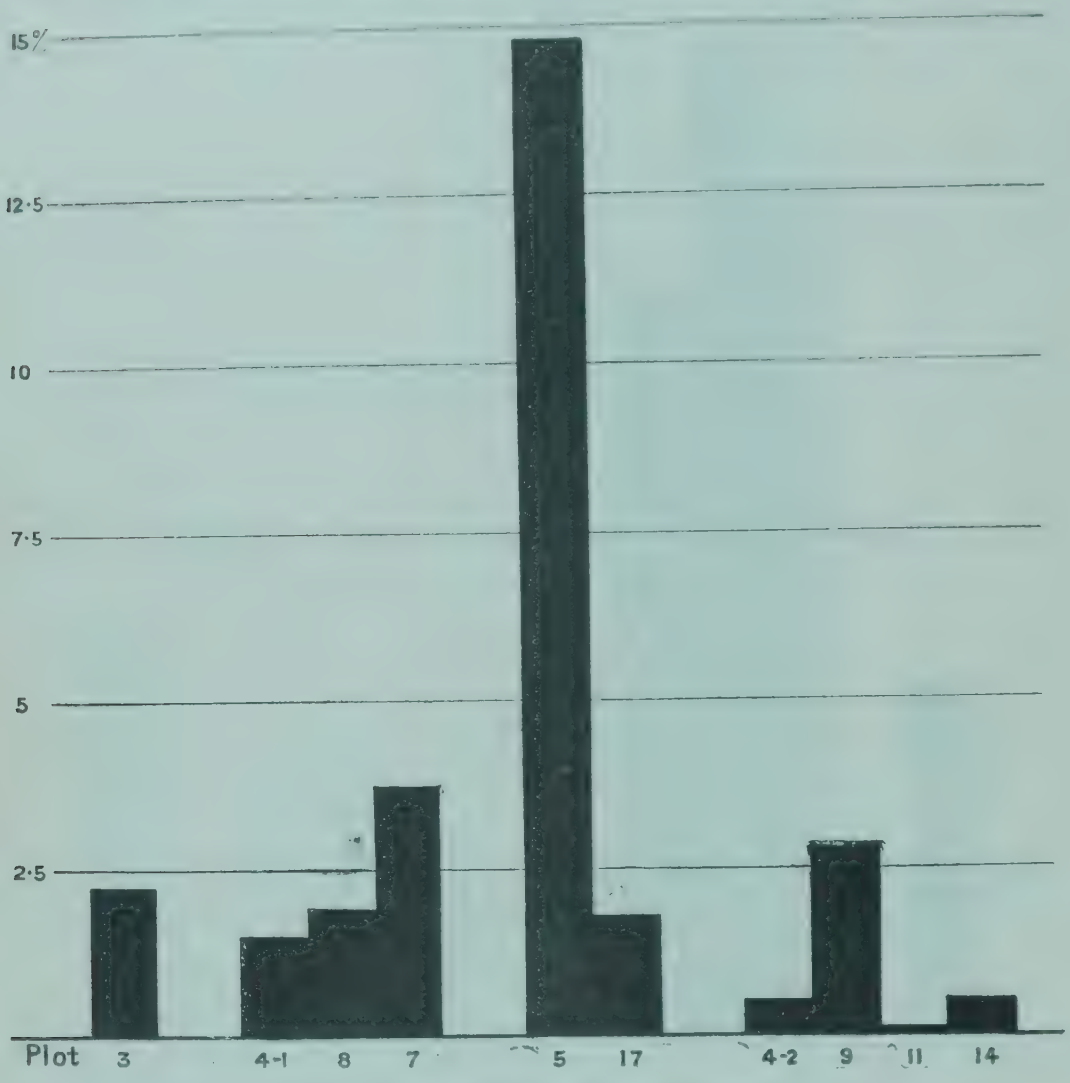


FIG. 7.—PERCENTAGE OF RUMEX ACETOSA.
For manuring, see fig. 5.

all plants, and this amount, if small, is still sufficient for fifty or a hundred years' growth of the plants which occupy the land.

We must not expect, then, to find in the plant that grows thus confined to a very small area some particular chemical substance which occurs in the soil of that area and nowhere else; in fact, we can rarely or never trace any such simple and direct action of a particular substance in the soil upon the plant. All plants contain the same elementary substances—carbon, nitrogen, potash, etc.: the differences come in the way these units are combined, just as Paris and London are alike built

TABLE I.

Percentage Composition of the Ash of Mangolds grown in various localities.

	Long Red	Unmanured			Grown near the sea	Grown 30 miles from the sea
		1	2	3		
Pure ash	7·84	7·59	5·48	10·90	6·72	5·39
Ferric oxide	0·71	0·36	0·39	0·60	0·65	1·30
Lime	2·77	3·25	3·50	2·58	3·35	7·53
Magnesia	3·56	5·84	4·63	2·69	2·69	3·23
Potash	37·06	64·52	66·80	38·33	11·21	18·40
Soda	33·88	6·86	10·91	31·17	56·40	43·97
Phosphoric acid	3·97	13·02	8·20	8·25	5·00	7·57
Sulphuric acid	4·22	2·99	2·54	2·41	6·04	3·06
Chlorine	10·98	2·43	3·91	18·13	15·29	12·30
Silica	5·24	0·68	0·36	0·31	2·74	5·42

TABLE II.

Percentage Composition of the Ash of different Plants grown at Rothamsted.

	Wheat	Barley	Clover (1st crop)	Swedes	Mangolds
Ferric oxide	0·95	1·04	1·05	2·38	0·89
Lime	4·30	9·13	36·98	23·43	9 72
Magnesia	3·04	4·34	5·00	2·76	3·27
Potash	17·42	15·35	13·32	26·24	29·68
Soda	0·11	2·31	0·70	3·52	16·72
Phosphoric acid	10·99	11·74	3·54	6·76	10·23
Sulphuric acid	3·60	3·98	2·08	13·33	4·51
Carbonic acid	—	1·61	34·39	16·14	17·07
Chlorine	1·60	1·75	2·51	3·91	8·65
Silica	58·35	49·14	1·02	2·43	1·20

TABLE III.

Percentage Composition of Typical Soils of Various Formations.

	Bagshot Sand	London Clay	Chalk from Thanet	Thanet Sand	Brick Earth	Folkestone Sand	Ragstone	Weald Clay
Moisture	0·94	5·09	2·93	1·62	2·45	0·98	2·03	6·09
Loss on ignition	4·44	7·42	5·06	3·46	4·65	4·53	4·82	10·59
Nitrogen	0·006	0·172	0·194	0·156	0·120	0·170	0·187	0·327
Alumina	0·11	11·75	3·60	2·34	3·33	Nil	3·58	10·45
Oxide of Iron	0·32	6·04	2·44	2·10	2·50	0·97	3·55	5·90
Oxide of Manganese	Nil	0·135	0·023	0·135	0·054	Nil	0·05	0·034
Magnesia	0·03	1·24	0·64	0·26	0·52	0·074	0·40	0·55
Lime	0·08	—	—	0·58	0·82	0·34	2·14	2·11
Carbonate of Lime	Nil	0·22	3·70	0·33	0·40	—	3·13	1·76
Potash	0·062	1·44	0·459	0·354	0·305	0·093	0·604	0·757
"Available" Potash	—	0·035	0·015	0·019	0·010	0·006	0·028	0·014
Phosphoric acid	0·017	0·111	0·094	0·095	0·074	0·047	0·373	0·180
"Available" Phosphoric acid	—	0·012	0·012	0·044	0·008	0·005	0·184	0·014
Sulphuric acid	0·014	0·054	0·040	0·010	0·03	0·069	0·05	0·138

out of stone and wood, brick and mortar, with remarkable divergences in the results—divergences which are really due to the characters of the architects, and not to the materials employed.

If, however, the chemical composition of the soil has so little effect upon the plant, how comes it that such enormous changes have been effected in the flora of the grass plots of Rothamsted by chemical differences of manuring? The explanation is to be found in the fact that on these grass plots a very intense struggle for existence is taking place; every species is trying to enlarge its borders at the expense of its neighbours, and if it receives ever so slight an advantage in the competition this advantage accumulates from year to year until the species becomes dominant. It is the presence of this factor of competition in the Rothamsted grass plots and in Nature which magnifies a small advantage or disadvantage until it may become the determining cause of the dominance or the entire disappearance of a given species on a particular soil. In fact, in many cases competition is the chief factor in Nature, and a plant occupies its particular situation solely because it there can escape from what would otherwise be a strangling competition. To take a well-known example, the yellow Horned Poppy (*Glaucium luteum*) is one of the most strictly localized plants in the British flora. It occupies the shingle banks of our coasts, and, exposed to violent alternations of temperature, fierce sun and wind, spray and drifting sand, it flourishes exceedingly, and would seem to have found conditions particularly congenial. Yet, if we introduce its seedlings into an ordinary rich garden soil, the Horned Poppy develops to an unprecedented degree, and shows by its vigour how much it can enjoy a fat living in comfortable surroundings. In fact, the Horned Poppy does not occupy the shingle bank because it likes it, but simply because it can exist there, whereas the grass and other plants that can crowd it out of existence on ordinary soils are unable to follow.

> "It does not love the shower nor seek the cold—
> That neither is its courage nor its choice—
> But its necessity in being old."

We must expect, then, in studying the adaptation of plants to particular soils to find no very apparent factors at work. We shall have to look deeply into the requirements of the plant, and try to pick out the comparatively small causes in the soil which act advantageously or disadvantageously, recognizing how operative these small causes can become under the stress of competition.

THE ADAPTATION OF THE PLANT TO THE SOIL. (II.)

By A. D. Hall, M.A., F.R.S.

[Being the fourth Masters Lecture, read March 22, 1910.]

In the previous lecture I tried to put before you some of the difficulties which attach to all attempts to correlate the plant with the composition of the soil on which it grows, and I hope that I have made it plain that many of the expectations which have been formed of the value of a soil analysis are doomed to disappointment. So similar are the substances found in all crops and in all soils that it becomes impossible to draw any *à priori* conclusions from chemical compositions alone why a given plant inhabits only a given range of country.

Let us now begin to attack the problem from a different point of view and study the distributions of a few crops over a small range of country.

Despite their greater adaptability, I take crops for my subject rather than wild plants, because we know so much more about their habits and their requirements. The map (Fig. 8) shows the distribution of fruit

Fig 8.—Distribution of Fruit in the Counties of Kent, Surrey and Sussex.

One dot equals 50 acres.

in the year 1908 in the counties of Kent, Surrey, and Sussex, a district which includes some of the most densely planted land in Great Britain, together with other areas where no fruit at all is grown. Each of the little dots in the map represents fifty acres of fruit; unfortunately, the agricultural returns from which the map has been compiled do not differentiate between the different kinds. Still, we know by experience very well what to expect in the different areas.

It will be noticed that the fruit-growing on a commercial scale is closely confined to certain areas, and since the whole district enjoys much the same climate, and has very similar railway facilities, the distribution is most likely to have been due to the character of the soil.

Indeed, if we now examine the geological map of this area we begin to see that the fruit lies almost wholly on certain formations. In North Kent it is on the Thanet sands and the deep loams above the Chalk; in East Kent, between Chatham and Canterbury and Sandwich, it is again the Thanet sands and Chalk loams that carry fruit, with the addition of a new formation—the Brick Earth. In Mid-Kent the fruit lies almost wholly upon what is known as the Lower Greensand. In this case, however, we see that it is not only the geological formation that determines the presence of fruit, because if we follow this same Greensand formation east of Sevenoaks the fruit disappears, and in its place we come to barren wastes covered with heather and pine. Anybody passing through one of these fruit areas to another would perceive that the soils possess certain features in common; they are mostly what a farmer would call light loams. This at once calls our attention to what we may call the farmer's way of classifying soils; he calls them loams, or sands, or clays, and defines them as heavy or light to work. We can now give precision to this farmer's point of view by making what we call a mechanical analysis of the soil, and this mechanical analysis at once gives us a clue to the distribution of any special crop like fruit.

Every soil is built up of a mass of particles of various sizes, and a mechanical analysis is merely a process by which the soil is sorted out into groups or particles of a specified size. If we dismiss from our consideration for a time its chemical nature, we see that a soil consists of a mineral framework of little pieces of rock of all sizes; when these are coarse and palpable we describe the soil as a sand; when they become so fine as to be undiscernible separately by the eye and almost imperceptible when the material is rubbed between the fingers we get a clay. A mechanical analysis sorts out all the various-sized particles making up the soil, and collects them into specified groups, so that we obtain for any particular soil the proportions in which these groups are mixed. The grades of particles into which we have been accustomed to divide soils are as follows:—

(1) Material about $\frac{1}{8}$ inch diameter is called Stones and Gravel, and is not reckoned in the analysis.
(2) Particles between $\frac{1}{8}$ inch and $\frac{1}{25}$ inch diameter, Fine Gravel.
(3) " $\frac{1}{25}$ " $\frac{1}{125}$ " Coarse Sand.
(4) " $\frac{1}{125}$ " $\frac{1}{625}$ " Fine Sand.
(5) " $\frac{1}{625}$ " $\frac{1}{2500}$ " Silt.
(6) " $\frac{1}{2500}$ " $\frac{1}{12500}$ " Fine Silt.
(7) Particles less than $\frac{1}{12500}$ inch, Clay.

Of course, in this connection the terms sand, silt, and clay possess the special meanings defined above. Soils are mixtures of all these grades of particles; the coarsest sandy soil will contain some clay in this special sense, while the heaviest clay soil will rarely contain 50 per cent. of it. The mechanical analysis of a soil simply takes up the farmer's point of view when he speaks of sand or loam or clay, and by reducing it to figures extends it and gives it precision.

On the size of the particles, whether fine ones or coarse ones predominate, depend such fundamental facts as how the soil will work, whether light or heavy, how soon will it be fit to work after rain, whether it will be cold and late or warm and early, its drought-resisting power, &c. The size of the particles making up the soil regulates, in fact, the water supply, and that is the biggest factor in producing a crop. If we now put together the mechanical analyses of all the soils on which fruit is found to grow successfully we shall find great similarity of type, whatever may have been the geological origin of the soil. For example, Table IV. shows the analyses of such a series, in which it will be seen that the good fruit soils all contain more than 12 but less than 17 per cent. of the very fine material which an analyst calls clay, and which does more than anything else to form the character of the soil. In all the soils, again, we find sand and silt, generally to the extent of from 60 to 70 per cent. of the whole, but as a rule there is not much coarse sand present. By way of contrast the analyses of two or three other soils are added. At one end of the scale come soils so light that they are only suited to strawberries or nursery stock which is not required to stand more than two or three years in the same place. On the heavy soils, at the other end of the scale, only occasional apple orchards occur, and are so unhealthy that they would be commercially unprofitable. Thus, by the consideration of such a map and of a long series of analyses of the soils in the district covered by the map it becomes possible to formulate the mechanical composition of what we may call a fruit soil, and again by the analysis of any unknown soil to decide whether it is fit for fruit-growing or not, provided the other conditions of exposure and elevation are suitable.

TABLE IV.

Mechanical Analysis of Fruit Soils.

Formation	Bagshot Sand	Thanet Sand	Thanet Sand	Brick Earth	Lower Green-sand	Chalk	Clay with Flints	Hast-ings Beds	Weald Clay
Locality	Wisley	Swanley	Selling	Wick-ham	East Farleigh	Minster	Molash	Rolven-den	Sutton Valence
	Only Nursery Stock	Straw-berries	Mixed Fruit	Mixed Fruit	Mixed Fruit	Mixed Fruit	Cherries, Apples	Apples, Black Currants	Apples, Bad *
Fine gravel .	0·1	1·3	0·8	0·4	2·7	0·7	1·4	0·4	2·3
Coarse sand .	18·1	10·9	5·3	0·9	10·9	9·7	1·6	0·7	4·4
Fine sand . .	70·1	62·3	60·3	32·4	35·3	38·3	39·2	27·3	12·5
Silt . . .	3·8	14·2	15·4	46·7	22·8	27·9	29·2	33·3	15·1
Fine silt . .	4·1	5·4	6·2	8·4	12·9	7·4	11·9	21·9	25·9
Clay . . .	3·8	5·9	12·0	11·2	15·4	16·0	16·7	16·4	39·8

* This soil is really too heavy for fruit, though apple orchards are found upon it.

When we turn to other crops we find similar correlation between their distribution and the mechanical composition of the soil. The maps (figs. 9, 10, 11) and Tables V. VI. VII. show this in the case of hops and barley and potatos. A plant which is grown on such a scale must

be one of the least fastidious as to soil, otherwise it could not have come into the widespread cultivation which makes it a farm crop; so that if we can apply this same mechanical analysis to the soil upon which many localized plants are found we should expect an even closer

FIG. 9.—DISTRIBUTION OF HOPS
One dot equals 20 acres.

FIG. 10.—DISTRIBUTION OF BARLEY.
One dot equals 40 acres.

FIG. 11.—DISTRIBUTION OF POTATOS.
One dot equals 20 acres.

correlation between the distribution of the plant and the mechanical composition of the soil.

We have not as yet, however, decided as to what the mechanical composition of the soil represents to the plant, which obviously cares nothing for the size of the particles as such. The size of the particles

however, does regulate the supply of water to the plant, because soils hold water in virtue of the amount of surface they possess, and this

TABLE V.

Mechanical Analysis of Hop Soils.

Formation	Thanet Sand	Alluvial	Thanet Sand	Brick Earth	Lower Green-sand	Clay with Flints	Brick Earth	Upper Green-sand	Hast-ings Beds	Weald Clay	Hast-ings Beds
Locality	Newing-ton	Yalding	Barton	Teyn-ham	East Far-leigh	Loyter-ton	Ickham	Bentley	Rolven-den *	Wood-church*	Ew-hurst *
Fine gravel .	0·5	3·5	0·3	0·8	2·7	0·9	0·3	6·6	0·5	0·7	3·4
Coarse sand	18·2	14·4	2·5	2·4	11·0	1·3	0·8	5·5	0·6	3·0	2·1
Fine sand .	61·6	44·0	38·0	44·2	35·3	28·2	26·3	29·7	27·3	17·1	15·4
Silt . .	8 9	18·2	39·6	29·6	22·8	46·5	47·7	29·0	33·3	28·2	23·8
Fine silt .	4·3	9·9	6·9	9·7	12·8	8·9	9·2	14·4	21·8	27·6	26·1
Clay . .	6·5	10·0	12·7	13·3	15·4	14·2	15·7	14·8	16·5	23·4	29·2

* These soils only grow the coarser varieties of hops successfully.

TABLE VI.

Mechanical Analysis of Barley Soils.

Formation	Lower Green-sand	Lower Green-sand	Thanet Sand	Lower Green-sand	Thanet Sand	Brick Earth	Chalk	Lower Green-sand	Clay with Flints	Chalk
Locality	Shalford	Easling	Gold-stone	Repton	Chislet	Shop-wyke	Minster	Alding-ton	Loyter-ton	Sutton * by Dover
Fine gravel .	2·7	1·2	0·2	2·8	1·4	0·8	0·6	1·1	1·3	0·6
Coarse sand	56·2	52·9	16·4	15·2	5·8	1·0	9·7	19·9	1·2	1·8
Fine sand .	28·0	21·4	48·2	48·8	35·2	30·8	38·4	34·1	35·7	16·4
Silt . .	5·2	7·1	18·6	15·5	36·5	33·5	27·9	11·3	29·0	24·7
Fine silt .	3·8	7·1	7·0	7·2	8·1	20·2	7·4	11·3	11·0	7·6
Clay . .	4·1	10·3	9·6	10·5	13·0	13·7	16·0	22·3	21·8	27·7
Carbonate of lime	—	—	—	—	—	—	—	—	—	20·3

* Though this soil contains a rather high proportion of clay for barley, it is kept open and easy-working by the large amount of carbonate of lime that is present.

TABLE VII.

Mechanical Analysis of Potato Soils.

Formation	Thanet	Lower Green-sand	Bagshot	Thanet	Bagshot	Thanet	Chalk	London Clay
Locality	Swanley	Nutfield	Bisley	Teynham	Claygate	Green-hithe	Minster	Chessing-ton
Fine gravel .	1·3	3·2	0·2	0·5	0·8	0·3	0·6	0·7
Coarse sand .	10·9	50·8	30·9	15·9	27·2	2·2	17·1	19·3
Fine sand . .	62·3	25·0	49·7	51·8	42·2	75·2	36·4	35·8
Silt . . .	14·2	3·8	5·6	16·1	12·3	4·0	24·6	16·9
Fine silt . .	5·4	9·6	6·1	5·8	6·7	5·4	6·8	10·2
Clay . . .	5·9	7·6	7·5	9·9	10·8	12·9	14·5	17·1

surface must increase the smaller the particles into which the given weight of soil is divided. It has been estimated, for example, that the total surface of the particles in a cubic foot of loam amounts to about

an acre; in a clay soil to about four acres. A soil absorbs water and retains it against drainage in virtue of the wet skin held on the surface by the attraction of each particle. Not only does the soil thus refuse to part with water to the drains through this surface pull, but it also holds water against the roots of the plant, so that sometimes the plant may be running short of water in a clay soil which still appears to be comparatively moist. Again, this attraction of the surface of all solid materials for water enables soils to suck up water from the subsoil during a period of drought in quantities dependent upon the grade of the soil. Thus, the mechanical analysis determines one of the greatest factors in the nutrition of the plant—namely, the supply of water.

At the same time the temperature is also conditioned by the water supply, because the great agent in maintaining soils at a low temperature is the amount of heat that is always being drawn away by the evaporation of water from the surface of the soil. Hence, a soil which holds a great deal of water close to the surface is always a cold soil, and artificial drainage is quite capable of making a difference of more than a degree in the average temperature of such a soil. Again, the moisture evaporating from the soil determines to a considerable extent the humidity of the air immediately above it—that is, of the air which surrounds an ordinary plant; and, as every gardener accustomed to the management of greenhouses is well aware, the humidity of the air is a potent factor in the well-being of a plant.

The structure of the soil as revealed by mechanical analysis forms, then, the chief of what we might call the causes determining the association of given plants with a given soil. We say the "chief" because on it hangs water supply, temperature, and humidity. Of course, the kind of climate set up by the structure of the soil may be greatly modified, or even overridden, by those other factors which determine local climate—such as elevation, aspect, and slope. We know, for example, that fields just at the bottom of a valley are subject to the most violent alternations of temperature. On a sunny day the temperatures will rise to a much higher degree at the bottom of the valley, simply because the moist air there collected acts like the glass of the greenhouse—lets the sun's rays through, but arrests the dark heat rays reflected from the ground, and so causes the heat to accumulate. On a still night, however, the valley temperatures are at the lowest, because the chill air from all the neighbouring slopes becomes denser and rolls down into the valley. These violent alternations of temperature may render the valley unsuited to the growth of certain plants, independently of the occurrence in such places of early autumn and late spring frosts, which in themselves render such a situation unsuitable for the commercial growth of fruit.

Returning now to the practical problem, as it presents itself to the gardener or fruit-grower, of whether a particular piece of land is suitable to his purpose, I think I may fairly claim that the mechanical analysis of the soil does give us information which can be trusted if it is used intelligently with due consideration of the other local climatic

factors which I have just indicated. For example, if an unknown soil is subjected to analysis one is able at once to say if the proportion of sand and clay are such as bring it within the limits which have been found by experience suitable to the growing of ordinary mixed fruit. We can further say that the soil might, on the one hand, be of a character that would not permit of the long duration of fruit-trees; or, on the other hand, of a character that would result in very slow growth. We can also indicate the methods which might be adopted to ameliorate the soil. Again, we might begin by the analysis of a number of soils on which roses are known to grow well, and so obtain a general idea of the composition of a rose soil, from which we may predict the behaviour towards roses of any unknown soil by its analysis alone. It should be noticed, however, that we are forced to proceed empirically; we have to analyse a number of soils which experience has shown to be suited to the plant in question before we can arrive at our type. In the present state of our knowledge it would be impossible to predict *à priori* the requirements of a plant which has not been under trial. This impossibility is particularly due to the fact that very little experimental work has yet been done on the nutrition requirements of the plant under natural conditions. To take an example, we know that all leaves are constantly transpiring water, and that the amount of water evaporated through the plant will be roughly proportionate to the amount of growth it makes; certain measurements have been made which indicate that for every pound of dry matter grown by the plant from 250 to 500 pounds of water will be evaporated through the leaves. The measurements also indicate that this factor must be a variable one, depending upon the dryness of the air, the amount of sunshine, wind, and similar external conditions; but no exact experimental knowledge is available. Again, we are accustomed to regard a waxy coating to the leaves, coverings of hair, &c., as devices for checking transpiration, though how far they do so has not, I believe, been experimentally demonstrated. Our knowledge, then, of the associations of given plants with given types of soil as determined by mechanical analysis will remain empirical for some time to come, and in our empirical method we must beware of being deceived through the effects of competition in nature. To return to our old illustrations, the mechanical analysis of a shingle bank would not reveal the kind of material the horned poppy likes best, although it is only to be found in such a habitat. In order to find the best type we must make our comparisons under strictly similar conditions, such as is attained in land under cultivation.

Turning now to the aspect of the soil which we have hitherto set aside—the chemical factors determining its association with given plants—the most important is probably the acidity or otherwise of the soil. As a rule our cultivated soils are kept neutral or in a very faintly alkaline condition by the presence of carbonate of lime, but in nature many soils occur which have developed a faintly acid reaction because they started with little or no carbonate of lime and the decay of vegetable matter

has given rise to small quantities of acid. These acid soils carry very distinctive types of vegetation, the plants of which are often intolerant of transference to a non-acid soil.

The reason does not appear to lie in the plant itself, for so far as we can learn from water-culture experiments plants grow freely and well in a medium that is distinctly acid when no other disturbing factors are allowed to come into play. In the field, however, the acidity or alkalinity of the soil determines entirely the character of the micro-flora which plays so large a part in the nutrition of the higher plants.

Under normal conditions plants are dependent for their nutrition upon the work of bacteria in the soil; the complex nitrogenous bodies contained in plant and animal residues are attacked by various groups of bacteria and converted into successively simpler compounds until they reach the state of ammonia. Ammonia does not long remain in a soil, but is in its turn converted into nitrates by the action of other bacteria. From these nitrates the normal cultivated plant obtains its nitrogen, though we are beginning to suspect that with the nitrogen supply of many plants ammonia is more concerned than has hitherto been supposed. For the proper working of these groups of bacteria a neutral or evidently alkaline medium is requisite, such as the presence of carbonate of lime ensures, while a very slight acidity is sufficient to suspend the action of nearly all such bacteria. On the other hand, we find the micro-fungi, the moulds, the wild yeasts, and other kindred organisms, which are also common in such a medium as the soil, are best favoured by a slightly acid medium, and may in their turn be repressed and rendered inoperative by making the medium neutral. Thus in an acid soil the normal bacterial actions are comparatively suspended, their place being taken by parallel changes brought about by fungi and moulds. The effects upon a higher vegetation of these differences in the micro-flora are very great. Experimentally it is on some of the plots at Woburn and Rothamsted that these effects can best be studied, because there certain portions of the land have been rendered acid artificially through the long-continued use of ammonium salts as manure. For reasons which need not be enlarged upon here, ammonium salts act as an acid, and unless the soil starts with a considerable proportion of carbonate of lime this acidity eventually accumulates until its effect becomes perceptible. On the Woburn plots which have become acid, barley now refuses to grow and the plots become covered with spurrey, a weed which is found only sparsely elsewhere on the same land, but which invades and completely swamps all other vegetation on the plots in question. At Rothamsted the acidity does not occur in the arable land but on certain of the grass plots, and there the surviving grasses have developed a habit of growing in tufts, with bare spaces between on which dead vegetation accumulates in a form resembling peat. It is clear that the formation of peat must be associated with the acid condition and the consequent suspension of bacterial actions.

As soon as the land is limed and made neutral, the bacteria come back and the peaty material slowly disappears, being oxidized and burnt up by the bacteria which re-establish themselves. In other respects the acidity or otherwise of the soil has a very potent effect upon certain special kinds of plants.

We know that many plants, notably heaths, Coniferæ, and orchids, do not draw their nutriment directly from the soil, but depend upon the mycelium of certain fungi which clothes their roots. Such plants grow, as a rule, in acid soil, where the production of ammonia and nitrates by bacteria is stopped, so that the plants depend for their nitrogen supply upon the power that the fungi associated with their roots (mycorhiza) possess of attacking and digesting the otherwise insoluble nitrogen compounds of the humus. The mycorhiza plants may even be recognized by their external appearance. Thus, as in the Rothamsted experiments, cereals fed upon ammonia are shorter in the straw and broader in the leaf with a deeper green colour than those supplied with nitrate, so, according to Stahl, the plants fed by mycorhiza possess a peculiar smooth shiny foliage and a distinctive colour. Naturally enough when any of these plants dependent upon mycorhiza are transferred to an alkaline soil in which their associated fungi do not flourish, they in their turn lose their vitality and may succumb entirely. Even if the plant is given a soil rich in humus but not containing the fungus with which it is usually associated it may refuse to grow. This has been found to be the case with orchids, the seeds of which only develop properly if sown on a medium partly derived from that on which the parent plant was growing.

So numerous are these cases of the association of a particular plant with acid or alkaline soils that it would seem to be a point worth watching by the practical cultivator of some of the difficult plants like alpines. It is, indeed, customary to consider whether the habitat of the plant is sandy, peaty, calcareous, or granitic, but two distinct factors are involved and may be confused. The soil may be acid or neutral, but it is not necessarily acid if it is sandy or even peaty; secondly, the soil may be calcareous or not, but if calcareous it is never acid. It is a fact of observation that certain plants are rarely or never found upon calcareous soils; for example, the foxglove, corn marigold, the sheep's sorrel, the cultivated Rhododendron, and many of the Ericas seem to be intolerant of such soils. In such cases, however, we have probably not positive poisoning by the lime but negative action due to the suppression of the acidity which these plants require. In other words, such plants are probably positively acid-humus-loving rather than lime-hating, though as the presence of carbonate of lime is incompatible with acidity they may appear to be negatively correlated with lime.

On the other hand, it can hardly be doubted that there is what we might call a positive calcareous factor, so specially associated are certain plants with soils rich in carbonate of lime, and so entirely are they absent from other soils which are perfectly neutral, but which

contain only a small proportion of carbonate of lime. Anyone botanizing in the South of England will have noticed how strictly certain shrubs like the wayfaring tree, the dog wood, the wild Clematis, and flowering plants like *Hippocrepis* and some of the orchids are confined to chalk and limestone districts; he cannot doubt that these plants do in some way depend upon the richness of their soil in carbonate of lime. Among the leguminous plants we find some of the most remarkable associations of particular species with calcareous soils. Some species, like the *Hippocrepis* we have mentioned, never occur elsewhere, while most of the cultivated species, particularly sainfoin and the clovers, are most at home on a calcareous soil. There are, however, others, like some of the species of *Lathyrus* and *Vicia*, lupins and serradella, which are typical sand-loving plants and seem to avoid the calcareous soils. There would seem to be a case of association that lends itself to experiment, yet as soon as such plants are placed under pot or trial plot conditions they seem indifferent to the amount of carbonate of lime in the soil. A year or two ago I selected some of these typical non-calcareous leguminous plants and had them grown at Woburn on a sand that contained practically no carbonate of lime, and at Rothamsted in a soil that was well limed at the outset. Both sets of plants grew well, and when an analysis was made of their ashes, as Table VIII. shows, they contained very similar amounts of lime, from whichever soil the plant had been derived.

TABLE VIII.

Percentage of Lime in Ash of Leguminous Plants

Species	Woburn (no $CaCo_3$ in soil)	Rothamsted (0·6 per cent. $CaCo_3$ in soil)
Vilfa villosa	19·0	26·9
Ornithopus sativus	27·1	20·7
Lupinus albus	18·3	15·9
L. varius var. angustifolius	36·1	38·3
L. luteus	30·6	31·9
Vicia fulgens	23·9	27·6
Lathyrus Cicera	18·3	15·6

Other successes have been reported when attempting to grow presumably lime-hating plants in calcareous soils, and one can only suppose that carbonate of lime does not inhibit plants like lupins, but on the other hand it favours the plants like *Hippocrepis*. It is a positive and not a negative factor. The experiments fail because we cannot introduce the element of competition in order to determine how much greater the vitality of the plant is in one case than the other. Under experimental conditions both sets of plants are relieved from competition and grow up to the maximum of their food and water supply, though the vitality of one may be so much the less that it would succumb under any stress of competition. We have, indeed, to bear in mind that the vigour which a plant can show, for example, by the amount of growth it makes, is little or no index to vitality.

A direct example of that may be seen at Rothamsted; in the year 1888 a portion of the wheat field was not harvested but left to reproduce itself naturally. A good crop came up in the following year from the self-sown seed, but throve very badly in the competition that ensued with the weeds. After four years only a few dozen starved ears of wheat could be found over the whole area, and since that time the wheat has entirely disappeared, and the land is occupied by intrusive grass and weeds of all kinds. Here, then, we see that wheat, which has been educated to yield a great bulk of material, may yet become incapable with all its vigour of competing with the plants which we typically call weeds, when both are left to struggle on the same piece of ground. Thus it will be seen that the experimental study of the association of particular plants with particular soils is fraught with difficulties of interpretation, so easily do secondary factors come into play and obscure the point at issue.

It has been my object in these lectures thus to point out the main factors which determine some causal connection between plant and soil. There are certain special cases where the presence of particular constituents in the soil, *e.g.* zinc, seems to produce pathological disturbances in the plant to the extent of giving rise to something which almost appears to be a new species. We have even met with reports indicating the possibility of thus bringing about those teratological changes which were studied by the distinguished man in whose honour these lectures were founded. The evidence is still too scrappy to be worth theorizing about; it is experiment that is called for in all these directions. The object of my lectures has been more to indicate the existence of these problems and the state of our ignorance than to provide you with any consistent theory or body of information. Obviously there cannot be a complete science of horticulture until we have ascertained both the most fitting soils in which to grow our garden plants and the reasons that underlie the choice, but it is by experiment and by experiment alone that such knowledge will be attained.

[Note.—Figures 1-7 are reproduced from the author's *Book of the Rothamsted Experiments*, and figs. 8-11 from the *Journal of the Farmers' Club*, by kind permission of Mr. John Murray and the Farmers' Club respectively.]

MENDEL'S LAW OF HEREDITY AND ITS APPLICATION TO HORTICULTURE.

By C. C. Hurst, F.L.S.

[Read May 4, 1909.]

Mendel's law was founded on simple characters in garden peas. In his experiments Mendel found seven pairs of characters that followed his law, namely:—

Rounded and *wrinkled* seeds.
Yellow and *green* seeds (cotyledons).
Coloured and *white* seed-coats.
Inflated and *constricted* pods.
Green and *yellow* pods.
Distributed and *bunched* flowers.
Tall and *dwarf* stems.

It will be observed that Mendelian characters consist of pairs of contrasts. Mendel found that in each case the two contrasting characters behaved in breeding as "dominants" and "recessives," the first-named of each pair being "dominant" and the other "recessive."

For instance, when a pure-bred tall pea was crossed with a pure-bred dwarf pea, the offspring were all tall, no matter which way the cross was made. In Mendelian terms tallness is "dominant" and dwarfness "recessive."

When the tall crossbreds produced seeds by self-fertilization, Mendel found that the offspring consisted of both talls and dwarfs, and on the average there were three talls to one dwarf.

It will be noted that the "recessive" dwarf character, after "skipping a generation," reappeared in a quarter of the offspring. Mendel found that these extracted dwarfs bred permanently true to the dwarf character, notwithstanding the tallness of their parents and ancestors.

The tall individuals of the same generation, however, proved to be of two kinds; on the average one-third of them were pure talls, breeding true to the tall character, notwithstanding their dwarf ancestors, while two-thirds of them were impure talls throwing dwarfs as well as talls, as their parents did before them.

The diagram (fig. 12) will serve to illustrate the results obtained by Mendel in crossing pure tall peas with pure dwarf peas and their behaviour in subsequent generations.

Mendel's Law of Segregation.

Mendel's law of heredity was based on the experimental facts noted above. In order to give a reasonable explanation of such facts, Mendel conceived the idea of the separation or segregation of characters in the germ-cells. Mendel supposed, as Darwin and his successors have

done, that each heritable character is represented in the germ-cells (both egg-cells and pollen-cells) by a certain determiner or factor. In the particular case we have been considering, the heritable characters are apparently tallness and dwarfness. Each individual plant raised from fertilized seed is the product of its two parents, consequently it is a double structure determined by the coming together of the paternal and maternal factors.

A pure-bred tall pea, for instance, may be said to be the outcome of the meeting of a paternal factor for tallness with a maternal factor for tallness. Similarly, a pure-bred dwarf pea may be regarded as the

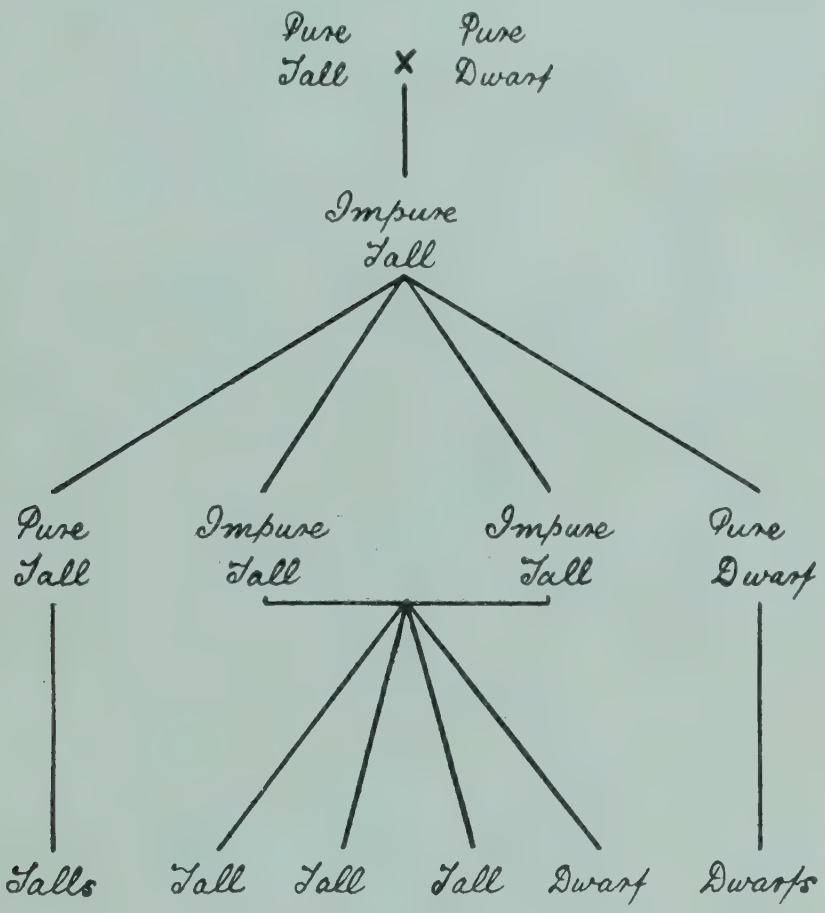


FIG. 12.—SHOWING THE RESULTS OBTAINED BY MENDEL IN CROSSING TALL AND DWARF PEAS.

consequence of the meeting of a paternal factor for dwarfness with a maternal factor for dwarfness. On the other hand, a cross-bred between a pure-bred tall pea and a pure-bred dwarf pea may be regarded as due to the meeting of the paternal factor for tallness with the maternal factor for dwarfness, or vice versa. MENDEL'S conception was that when the cross-bred formed its germ-cells (egg-cells and pollen-cells), the factors for tallness and dwarfness separated, the tall factor going into one germ-cell and the dwarf factor into another. In that case the germ-cells of the cross-bred would be of two kinds, and on the average one-half of them would be carrying the tall factor and

one-half of them would be carrying the dwarf factor. Consequently, when the cross-bred was self-fertilized four distinct results would happen, on the average with equal frequency:—

(1) A pollen-cell carrying the tall factor might meet an egg-cell containing the tall factor, giving rise to a pure tall plant.

(2) A pollen-cell carrying the tall factor might meet an egg-cell containing the dwarf factor, giving rise to an impure tall plant.

(3) A pollen-cell carrying the dwarf factor might meet an egg-cell containing the tall factor, giving rise to an impure tall plant.

(4) A pollen-cell carrying the dwarf factor might meet an egg-cell containing the dwarf factor, giving rise to a pure dwarf plant.

The diagram (fig. 13) on p. 25 will serve to illustrate MENDEL's conception of germinal segregation. The tall plants are represented by oblongs and the dwarf plants by squares. The germ-cells of each plant are shown as circles. The contained tall factors appear black and the dwarf factors white.

If the diagram is compared with the previous one, it will be seen that MENDEL's conception of germinal segregation fully explains the results obtained in his experiments. In further confirmation of the above interpretation of his results, MENDEL made all the possible matings between the three germinal types. As we have already seen (fig. 12), both the extracted pure types bred true, while the impure type selfed gave all three types again. MENDEL also mated the impure talls with the pure talls, and these gave, on the average, equal numbers of impure talls and pure talls. He also mated the impure talls with the pure dwarfs, and these gave, on the average, equal numbers of impure talls and pure dwarfs.

The diagram (fig. 14) on p. 26 will illustrate these matings and their results, and at the same time Mendelian segregation.

THE "PRESENCE AND ABSENCE" METHOD.

Recent experiments with many different characters in various plants and animals fully confirm MENDEL's results with peas, and show clearly that MENDEL's law of heredity is capable of general application. At the same time these results have suggested a more simple method of presentation of the facts of Mendelian segregation, which not only explains later developments better, but puts a different construction on the important phenomenon of Mendelian dominance. It is curious to observe how this striking phenomenon of dominance has proved a stumbling-block to many in their comprehension of the Mendelian principles, and yet seemingly it was this phenomenon that enabled MENDEL to discover his simple law of segregation.

There seems to be no doubt that MENDEL himself regarded tallness and dwarfness, for instance, as a definite pair of contrasting characters, which behaved in breeding as "dominant" and "recessive," and MENDEL seems to have imagined that the definite germinal factors of each contrasting character actually segregated from one another in the

reproductive cells. In view of recent experiments, however, we prefer to regard it more simply. In common with MENDEL we regard tallness, for instance, as due to a definite germinal factor *present* in the tall pea, but on the other hand we regard dwarfness as simply due to the *absence* of the tall factor from the dwarf pea.

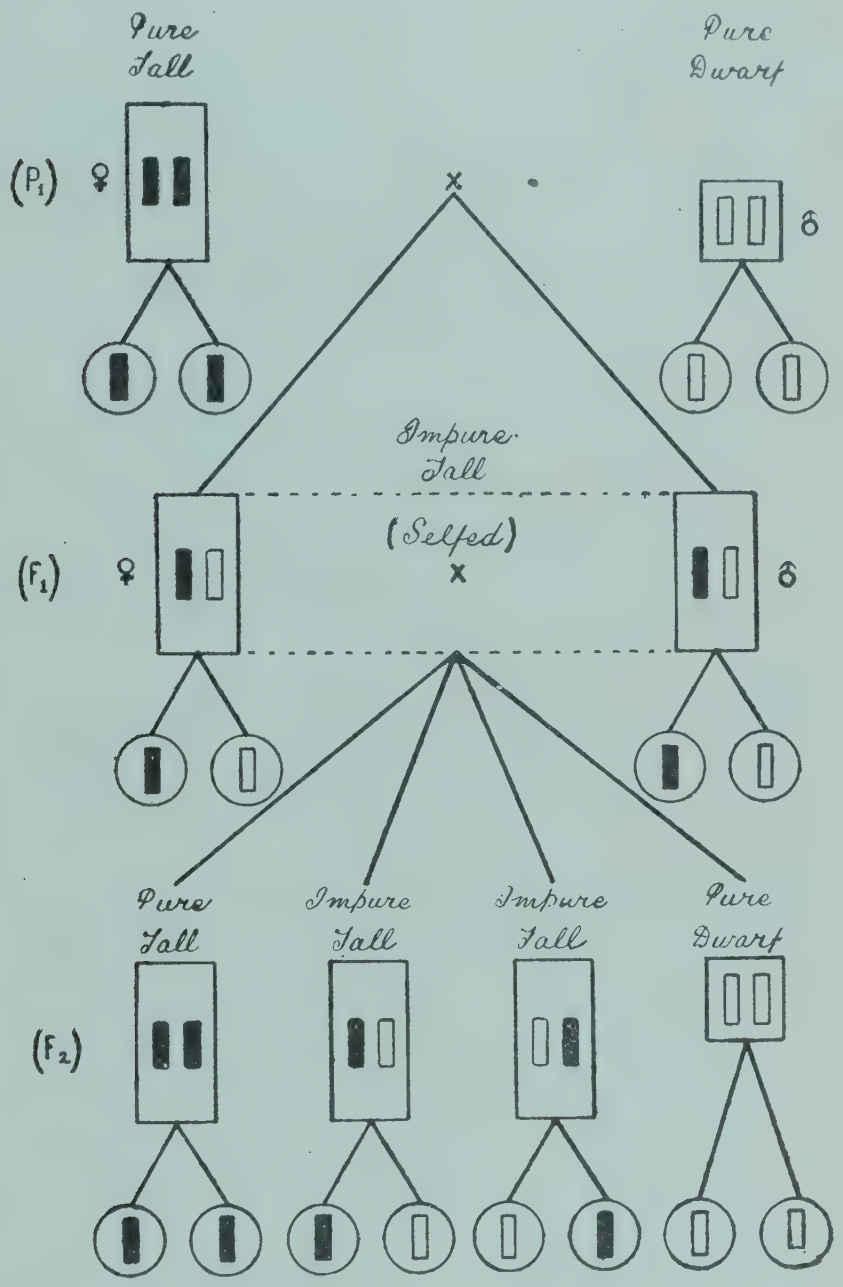


FIG. 13.—ILLUSTRATING MENDEL'S CONCEPTION OF THE GERMINAL SEGREGATION OF THE FACTORS FOR "TALLNESS" AND "DWARFNESS" IN PEAS. (ALSO ILLUSTRATING THE "PRESENCE AND ABSENCE" METHOD.)

Thus in the *presence* of the tall factor the pea is tall, while in its *absence* the pea is dwarf.

Tallness appears to be dominant simply because it is present, and in its absence the seemingly recessive character is manifested. We

to regard "presence" and "absence" of tallness as contrasting characters, rather than tallness and dwarfness. At first sight this may appear to be a distinction without a difference. But reality the difference is important and promises to lead to far-reaching

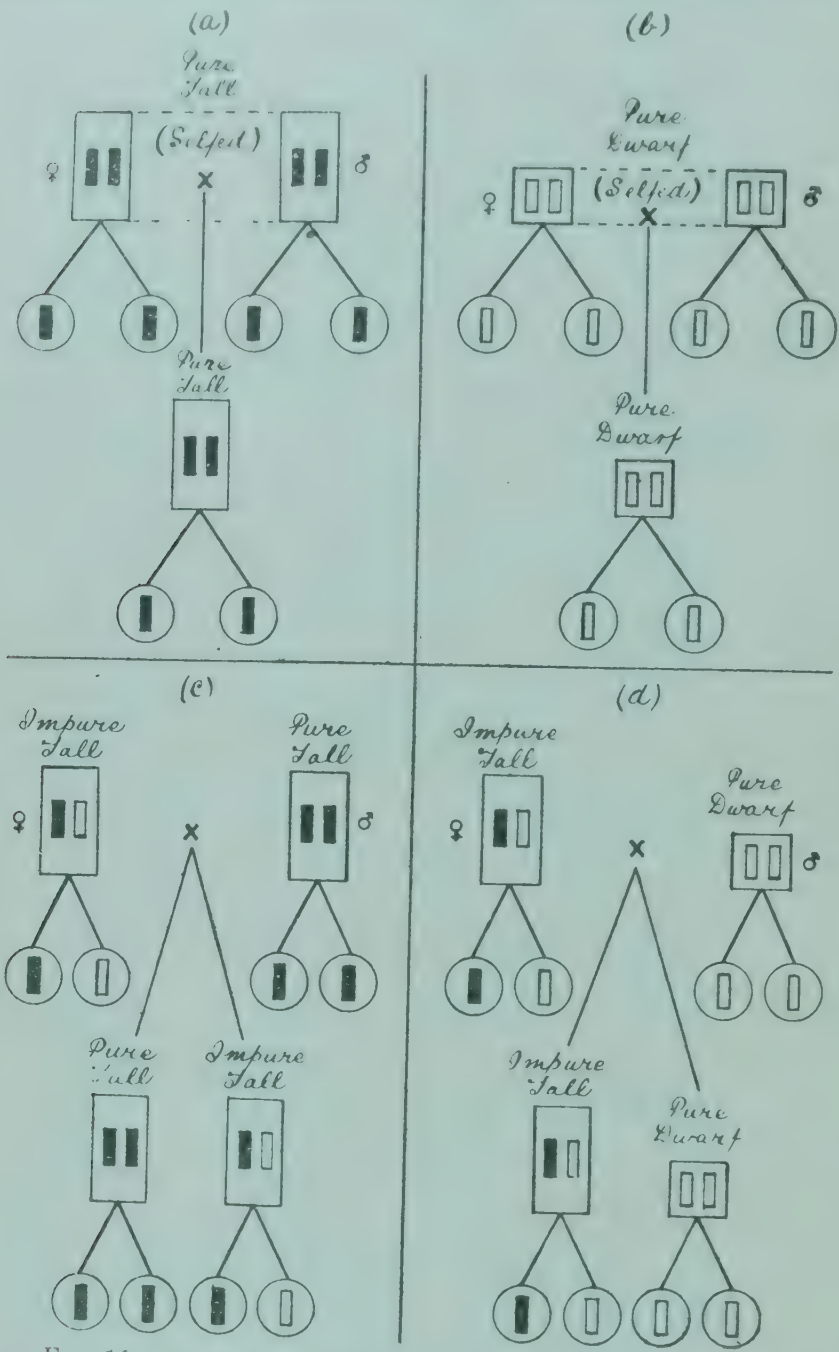


FIG. 14.—FURTHER ILLUSTRATING MENDELIAN SEGREGATION. (ALSO "PRESENCE" AND "ABSENCE.")

consequences, for it means that each heritable factor is a unit that may be distinct in its inheritance from all other factors. It is simply in its "presence" and "absence" that each heritable factor follows Mendel's Law. The two diagrams above will also serve to illustrate the "presence and absence" method (figs. 13 and 14). In these the

" presence " of the tall factor is marked by the presence of black in the spaces, while its " absence " is shown by the absence of black in the spaces, leaving them apparently white. It will be observed that in the pure talls there is a double presence of the tall factor made up of a single presence from each parent, while in the impure talls there is only a single presence from one parent.

In other words, in the pure talls there is a double presence and in the impure talls a single presence, while in the pure dwarfs there is a complete absence of the tall factor.

In the same way we may take it that the presence of the factor for roundness prevents wrinkling and the pea is rounded, while in the absence of the round factor the pea is wrinkled. Similarly the presence of the factor for yellowness changes the green peas into yellow, while in its absence the peas remain green, and so on with other characters.

The Phenomenon of " Dominance."

The " presence and absence " method puts a different construction on the question of Mendelian " dominance." From the standpoint of " presence and absence " we cease to regard " dominance " as a particular mode of inheritance. We look upon it simply as due to the " presence " of a higher factor which somehow conceals the manifestation of a lower factor. Thus when we speak of a yellow pea as being " dominant " to a green pea we simply mean that the " presence " of the higher " yellow " factor conceals the manifestation of the lower " green " factor and the pea is yellow. On the other hand, in the " absence " of the higher " yellow " factor, the lower green factor, *present all the time in the yellow pea*, is manifested and the pea is green.

So far we have hardly any indications as to how the higher factors conceal the " presence " of the lower factors, but it seems likely that this phenomenon is part of the larger question of the interactions between the various unit factors in the production of visible characters. The complete solution of this important problem is for the future, and when it is fully solved, no doubt, we shall know more about heredity and variation. From the results of various experiments with plants and animals we already know that complete " dominance " is far from universal. In many cases the " dominance " is incomplete, the lower " recessive " character being manifested in various degrees in the cross-bred.

In such cases it would appear that a single presence of a unit factor produces a different result from a double presence of the same factor. In other cases interaction between two unit-factors produces a new form distinct from both parents. It seems likely too, that the familiar blended and mosaic forms met with, especially in hybrids between distinct species, are also due to the varied interactions between different unit-factors. All this goes to show that the phenomenon of Mendelian " dominance," though important, is but a secondary consideration quite distinct from Mendel's law of segregation.

In view of the adoption of the "presence and absence" method, which in the circumstances seems inevitable, the question naturally arises whether it is quite expedient to retain for general use the Mendelian terms "dominant" and "recessive." If these terms are applied in the original sense, as they usually are, to the "dominance" of a higher unit-factor over a lower unit-factor, then from the standpoint of "presence and absence" the application is unsound. While, on the other hand, if the terms are more properly restricted to the "presence" and "absence" of a single unit-factor it is to be feared that considerable confusion must arise.

On the whole, therefore, it would seem better to use the terms "higher" and "lower" ("epistatic" and "hypostatic" of BATESON) in place of "dominant" and "recessive," where two unit-factors are concerned.

APPLICATION OF MENDEL'S LAW TO HORTICULTURE.

Recent experiments have shown that many simple characters in garden plants follow MENDEL'S law. When the unit-factors happen to correspond with the horticultural characters, it is a simple matter for the breeder to breed quickly what he wants; for he knows that, according to MENDEL'S law, the plant manifesting the *lower* factor will breed true at once, and that by breeding from several individuals manifesting the *higher* factor one will be found which breeds true. This enables the breeder to dispense entirely with the old and laborious method of so-called "fixing" by continuous selection, which method, though usually effective in the end, is now clearly recognized as a waste of time.

MENDEL'S law provides a much quicker and more effective method of achieving the same result. Mendel's method was simply to *breed from single individuals separately*. By so doing the breeder can select the particular individual which breeds true in accordance with his requirements and increase his stock solely from that source. In that way the grower secures at once a true and permanent stock, which can be maintained simply by isolation.

BREEDING NOVELTIES BY RE-COMBINATION.

The combination of two pairs of simple characters by crossing, and the results which follow the self-fertilization of such crosses, are of great utility to the breeder, for in the process of re-combination following Mendelian segregation new forms arise which will breed true in accordance with MENDEL'S law. Thus, MENDEL himself crossed a round yellow with a wrinkled green pea, and obtained in the second generation two new forms—round green and wrinkled yellow peas, some of which bred true at once in accordance with his law.

By following MENDEL'S law MR. W. CUTHBERTSON, the well-known grower of sweet peas, states that he obtained in the *second* generation a true stock of the new and valuable variety, 'Waved King Edward,' by simply crossing the plain red 'King Edward' with the waved

pink 'Countess Spencer.'* The diagram (fig. 15) will illustrate how this was done. The plain red variety, 'King Edward,' crossed with the waved pink variety, 'Countess Spencer,' produced in the first generation (F_1) a plain red cross-bred, the lower waved and pink characters not being manifested, owing to the presence of the higher plain and red factors.†

In the second generation (F_2) the plain red cross-bred self-fertilized produced four forms—plain red, plain pink, waved red, and waved pink—in accordance with MENDEL's law.

MR. CUTHBERTSON did not apparently count the numbers of each type, but there should have been on the average nine plain reds, three plain pinks, three waved reds, and one waved pink. That is to say, out of every sixteen plants raised, three plants of the novelty 'Waved

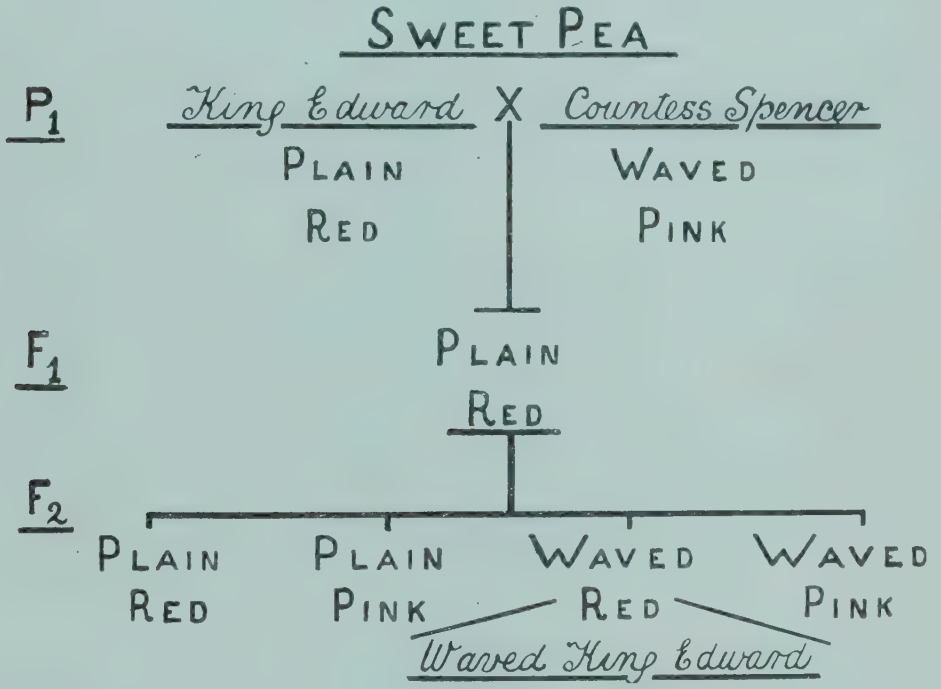


FIG. 15.—SHOWING THE ORIGIN OF THE 'WAVED KING EDWARD' SWEET PEA BY RE-COMBINATION FOLLOWING MENDELIAN SEGREGATION.

King Edward' would be the Mendelian expectation. On the average, one of these would breed true, while two would throw waved pinks again. By selecting the pure individual MR. CUTHBERTSON would thus secure a pure strain of the novelty in the second generation.

MR. CUTHBERTSON states that he raised the novelty 'Primrose Spencer' in a similar manner.

In my own experiments a few years ago I raised a true stock of 'Black Knight Cupid' in the second generation by crossing the ordinary

* *Sweet Pea Annual*, 1909.

† From a few results that I have seen it seems likely that when the 'Waved' or 'Spencer' type of sweet pea (now so popular with sweet-pea fanciers) comes to be critically studied in its Mendelian relationship to the "plain" and "hooded" types some complications will be found. Indeed, it would not be surprising to find that there are at least two genetic types of the 'Waved' sweet pea.

tall 'Black Knight' with 'Pink Cupid.' In this case, however, three pairs of characters were concerned in the cross, and consequently, on the average, only three plants out of sixty-four were expected to be 'Black Knight Cupid,' and only one of these should breed true.

The actual numbers were as follows:—

In the first experiment, out of 244 plants there were ten 'Black Knight Cupids,' the Mendelian expectation nearest in whole numbers being eleven. In the second experiment, out of 166 plants there were seven 'Black Knight Cupids,' the expectation being eight. In the third experiment, out of 165 plants there were only three 'Black Knight Cupids' instead of the expected eight.*

Adding the results of the three experiments together, there were out of 575 plants twenty 'Black Knight Cupids,' where twenty-seven was the Mendelian expectation.†

In the next generation (F_2) some of the 'Black Knight Cupids' bred quite true, while others did not. Curiously enough, one plant gave a mixture of 'Black Knight Cupids' and *Wild Purple Talls*, which was probably due to the intervention of bees.

The following diagram (fig. 16) will illustrate the above experiment:—

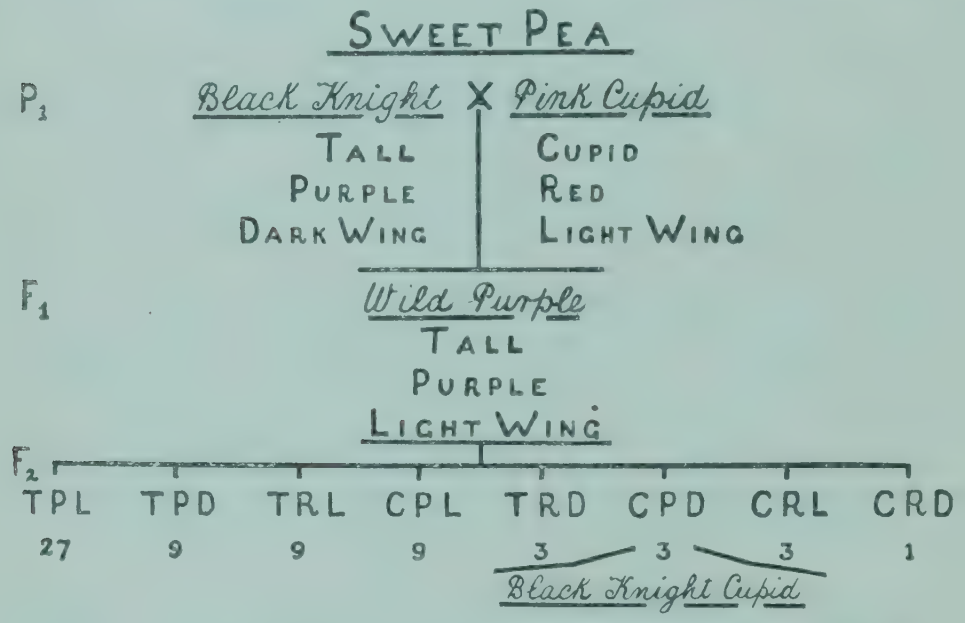


FIG. 16.—SHOWING THE ORIGIN OF THE 'BLACK KNIGHT CUPID' SWEET PEA BY RE-COMBINATION FOLLOWING MENDELIAN SEGREGATION.

T = tall; C = Cupid; P = purple; R = red; L = light wing; D = dark wing.

T, P, and L are higher factors; while C, R, and D are the corresponding lower factors.

* In this experiment there were ten 'Cupids' which somehow failed to flower, owing probably to their being overcrowded.

† In these experiments there was throughout a fairly uniform excess of talls, purples, light wings, and long pollens, with a corresponding deficiency of Cupids, reds, dark wings, and round pollens, the cause of which is at present obscure. On the whole the numbers were nearer 4 : 1 than the expected 3 : 1. There was also a partial coupling of purple colour with long pollen and red colour with round pollen, but all the other characters were inherited independently.

Compound Characters.

In many cases, however, the unit-factors do not happen to correspond with the horticultural characters, and interesting complications then arise. For instance, in my experiments with tomatos, red and yellow fruits behaved as units, red being the higher and yellow the lower; the presence of the "red" factor gave a red tomato, while in the absence of the "red" factor the tomato was yellow. But when the fiery red variety, 'Fireball,' was crossed with the pale-yellow variety, 'Golden Queen,' four distinct colour varieties appeared in the second generation (F_2). There were two kinds of reds and two kinds of yellows. This I found to be due to the fact that the fiery-red colour of 'Fireball' was really a compound of two unit-factors, representing red flesh and yellow skin, while 'Golden Queen' had yellow flesh and white skin. Consequently in the second generation two new varieties arose by re-combination—a carmine or "pink" tomato with red flesh and white skin, and a deep yellow tomato with yellow flesh and yellow skin. In accordance with the Mendelian expectation, a few individuals of these two new varieties bred true, while others did not.

The following diagram (fig. 17) will illustrate the results obtained in this experiment:—

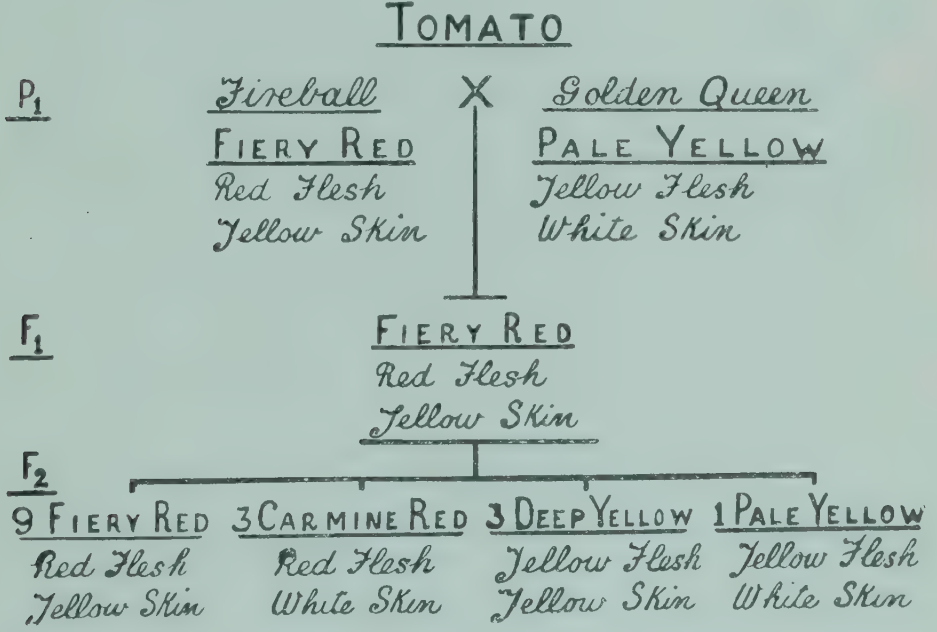


Fig. 17.—Showing the compound nature of the red fruit of the 'Fireball' Tomato and the appearance of two new forms by re-combination following Mendelian Segregation.

It will be observed that red flesh and yellow skin are both represented by higher factors appearing in F_1, while yellow flesh and white skin are represented by lower factors which are not manifested in F_1, owing to the presence of the higher factors for red flesh and yellow skin.

The Mendelian expectation of the four forms in the second generation was, of course, 9 : 3 : 3 : 1. The actual numbers observed were 31 : 11 : 10 : 3.

Similarly, Professor Bateson, by crossing a red sweet pea with a cream-coloured one, obtained *whites* in the second generation, the whites arising from the re-combination of the colourless plastids of the red sweet pea with the colourless sap of the cream sweet pea. The following diagram (fig. 18) will illustrate the results obtained by Professor Bateson in his experiment:—

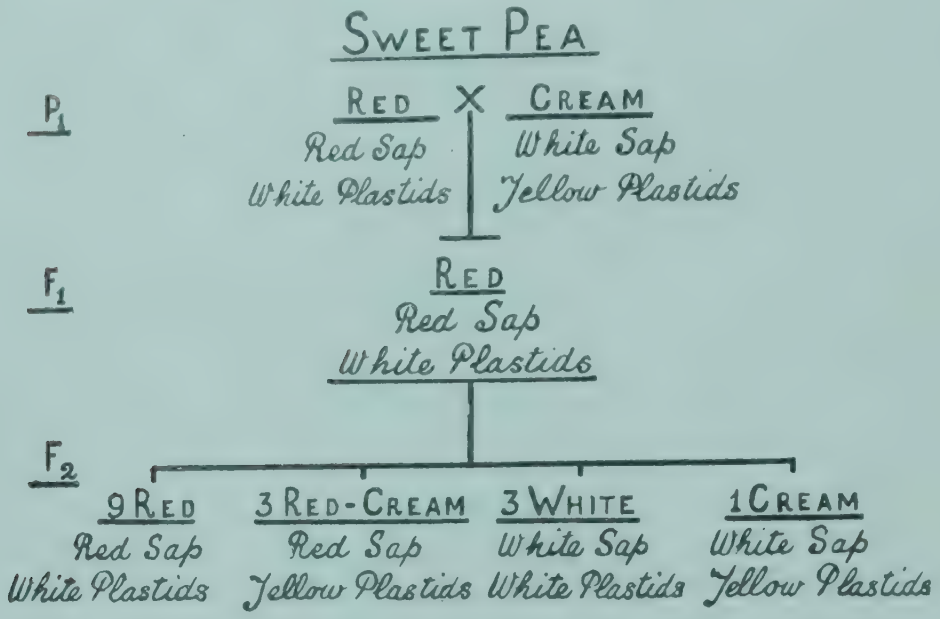


Fig. 18.—Showing the origin of a White Sweet Pea by crossing a Red with a Cream. Re-combination following Mendelian Segregation. (After Bateson, Saunders, and Punnett.)

An even more interesting result of the same nature has been obtained by Professor Bateson and Mr. R. C. Punnett by crossing the Bush and Cupid forms of sweet peas.

In the first generation (F_1) all the crossbreds were, curiously enough, tall in habit like the ordinary sweet pea. In the second generation (F_2), however, there arose in Mendelian proportions tall, bush, ordinary prostrate Cupid and a new variety called 'Erect Cupid' with a peculiar habit of growth something like box-edging. This result has been shown to be due to the compound nature of these horticultural characters, the crossing of which leads to various re-combinations in accordance with Mendel's law. The diagram (fig. 19) on page 33 will illustrate Professor Bateson's experiment and demonstrates the true nature of the tall, bush, and Cupid forms of the sweet pea.

Professor Bateson, Mr. R. C. Punnett, and Miss Saunders have also found that the red colour of sweet peas and ten-week stocks is a compound character due to the presence of two unit-factors, in the absence of one of which the flower is white or cream. They also found that purple colour in sweet peas and stocks is due to the presence

of a third unit-factor which only becomes patent in the presence of the other two. From this discovery follows the interesting fact that 'albino' sweet peas and stocks (white or cream) may carry certain sap-colour factors which may become patent when the "albino" is crossed with another "albino" or with a coloured form. Other experiments show that various species of plants behave in a similar way.

For instance, Professor Bateson and Mr. R. P. Gregory crossed *Primula sinensis* 'Crimson King' with *Primula sinensis stellata* 'Primrose Queen' (an "albino" form, white with large yellow eye). In the second generation (F_2) this cross gave crimson, magenta, rose, tinged white, and pure white forms: each colour appeared with small-eyes and large-eyes. All these appeared in "*sinensis*" and "*stellata*" forms, there being at least eighteen distinct forms, some of which bred true in accordance with Mendel's law.

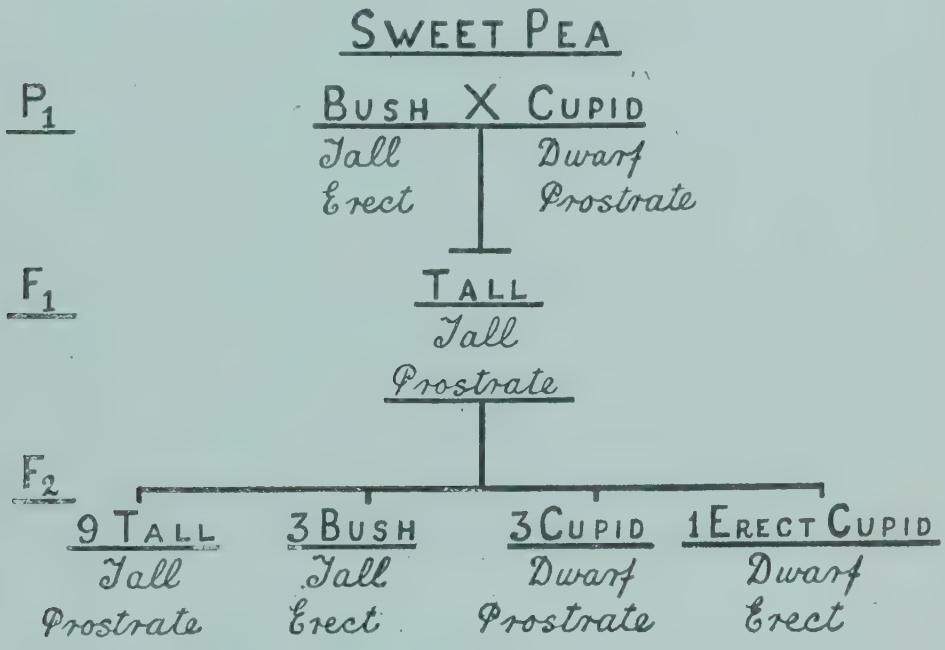


Fig. 19.—Illustrating the compound nature of tall, bush, and cupid forms of Sweet Peas. (After Bateson, Saunders, and Punnett.)

In my own experiments I obtained similar colours by crossing crimson and white forms of the ordinary *P. sinensis*.

In another of my *Primula* crosses—palm-leaved "*stellata*" with red stems and pink flowers, crossed with fern-leaved "*sinensis*" with green stems and white flowers, I obtained in the second generation (F_2) 36 distinct forms, of which 34 were new in the sense that they were distinct from the original parents. Of these 34 I found that 14 could be bred true, while the remaining 20 were unfixable, being Mendelian hybrids.

Practical Value of Unit-Factors.

In view of the fact that a decade has hardly passed since the rediscovery of Mendel's long-lost paper, the progress made in Mendelian studies is indeed remarkable. Thanks mainly to the genius of

Professor Bateson and the untiring labours of his co-workers at Cambridge, Mendelian analyses of garden plants have rapidly extended our knowledge of unit-factors. Equipped with such knowledge the practical breeder will be able to make new combinations with a certainty undreamed of ten years ago, and more important still, the breeder, by the use of Mendel's law, will be able to produce his novelties ready "fixed" without loss of time, and by strict isolation will be able to maintain a true stock without the trouble of "rogueing." It is impossible to refer in detail to the considerable work that has already been done in discovering unit-factors in garden plants by many experimenters. The numerous experiments with peas, beans, sweet peas, ten-week stocks, snapdragons, primroses, and other plants, by Mendel, Bateson, Punnett, Saunders, Correns, Tschermak, Johannsen, Lock, Biffen, Wheldale, Gregory, Shull, Emerson, Baur, and others are now well known.* These valuable pioneer contributions are however but a beginning, and when we survey the vast extent of the field still unexplored, we realize that a huge harvest of results remains to be reaped by future experimenters. The unit-factors of such valuable garden plants, for instance, as orchids, roses, rhododendrons, chrysanthemums, dahlias, begonias, cinerarias, carnations, pansies, petunias, poppies, clematis, iris, gladiolus, lilies, geraniums, fuchsias, gloxinias, etc., are as yet practically unknown, to say nothing of the more difficult but equally important garden fruits, such as apples, pears, plums, cherries, gooseberries, currants, and strawberries. So far no garden plant can be said to have been thoroughly worked out by Mendelian analysis, but in a few cases great progress has been made, and for the practical guidance of breeders we may refer in some detail to two cases, the snapdragon and the sweet pea, which will serve as an illustration of the practical value of unit-factors. We will take the case of the snapdragon first, as the factors so far only refer to the flower colours.

Unit-Factors in the Snapdragon (*Antirrhinum majus*).

For the elucidation of the complicated colours of the modern snapdragon we are indebted to the exhaustive experiments of Miss Wheldale at Cambridge. No less than sixteen thousand plants have been raised and flowered in the course of these experiments. So far, Miss Wheldale has found at least seven unit-factors which go to make up the flower-colours of the snapdragon. All these factors are evidently present in the original wild form, which has self-coloured flowers of a "magenta" hue. Five of these factors may be represented as follows†:—

Y representing yellow colour in the lips.

I representing ivory colour in the lips.

* For references and details see Professor Bateson's *Mendel's Principles of Heredity*. Camb. Univ. Press, 1909.

† The remaining two factors are S representing a striped or streaked condition of the intensified magenta, and another factor representing a carmine pink pigment, which is present in the newer varieties of snapdragon known in gardens as 'Rose Dore.' The precise properties of these two factors are not yet fully known, so that for the present they may be omitted. Miss Wheldale states that the S factor behaves as a recessive to the D factor. It would appear there-

L representing magenta tingeing in the lips.
T representing magenta tingeing in the tube.
D representing intensification of the magenta colour in the lips and tube.

The presence and absence of these five factors in various combinations and in their varied relations and interactions have given rise to the numerous colour-forms of the modern snapdragon, now so familiar in gardens. The following table will illustrate this so far as the five factors are concerned:—

FACTORIAL TABLE FOR FLOWER COLOURS IN THE SNAPDRAGON (*Antirrhinum majus*).

YILTD	Self-coloured magenta lips and tube (e.g. *wild form*, *Carmine King*).
YILT	Ivory lips and tube tinged with magenta.
YILD	Magenta lips and ivory tube (e.g. *Delila*).
YITD	Ivory lips and tube.
YLTD	Crimson lips and magenta tube (e.g. *Crimson King*).
ILTD	Pure white.
YIL	Ivory lips tinged with magenta, and ivory tube.
YIT	Ivory lips and tube.
YID	,, ,,
YLT	Yellow lips and ivory tube tinged with magenta.
YLD	Crimson lips and ivory tube.
YTD	Yellow lips and ivory tube (e.g. *Yellow Prince*).
ILT	Pure white.
ILD	,, ,,
ITD	,, ,,
LTD	,, ,,
YI	Ivory lips and tube.
YL	Yellow lips tinged with crimson, and ivory tube.
YT	Yellow lips and ivory tube (e.g. *Yellow Prince*).
YD	,, ,, ,, ,, ,,
IL	Pure white.
IT	,, ,,
ID	,, ,,
LT	,, ,,
LD	,, ,,
TD	,, ,,
Y	Yellow lips and ivory tube (e.g. *Yellow Prince*).
I	Pure white.
L	,, ,,
T	,, ,,
D	,, ,,
All absent	Pure white.

fore that the striping is due to the absence of a factor for uniform colour (say U) and that in the wild form this factor U is present together with D.

It will be observed that the various relations and interactions between the five factors in the case of the sweet pea are particularly interesting and suggestive. The factors I, L, T, and D can only be manifested in the presence of Y. In the absence of Y the flowers are pure white, while in the presence of Y all are coloured. I with Y gives "ivory." L with Y gives "crimson," but with I in addition it gives "magenta." T and D can only be manifested in the presence of L.

In order to show the simple effects of the presence and absence of the five factors and their somewhat complicated relations and interactions only a single presence of each factor is shown in the table. In accordance with MENDEL's law, however, it will be quite understood that a pure-bred form would have a double presence of each factor; thus the pure-breeding wild form would be constituted YYIILLTTDD and so on with the others. MISS WHELDALE found that the single presence of these five factors gave the same visible result as the double presence, except that the single presence of L gave a lighter shade of "magenta" than the double presence.

The breeding results from the single presence and the double presence would, of course, be quite different. All the above combinations of factors may occur with either a double presence or a single presence of each factor in various combinations, in accordance with MENDEL's law.

In the course of her experiments MISS WHELDALE has incidentally cleared up certain difficulties in regard to the form known in gardens as 'White Queen.' This form has apparently *pure white* lips and tube, with a yellow palate. Nevertheless, MISS WHELDALE's experiments demonstrate conclusively that in breeding it behaves precisely as if it were an *ivory*, the yellow form extracted from it in the second generation being rather paler in shade than the ordinary yellow.*

UNIT-FACTORS IN THE SWEET PEA (*Lathyrus odoratus*).

The sweet pea has been specially investigated by PROFESSOR BATESON, MISS SAUNDERS, and MR. PUNNETT. So far at least twelve unit factors have been found which determine the habit of growth, flower form, and colour. All these factors are evidently present in the typical wild sweet pea, which has a tall and prostrate habit, with dark leaf axils; the flowers have an erect purple standard, with blue wings, the anthers are fertile, and the pollen grains are long.

Eight of these factors may be represented as follows:—

T representing tallness of growth.
P representing prostrate habit of growth.
W representing whiteness in the flower.
C representing first sap-colour factor.
R representing second sap-colour factor. } Red colour in the flower.

* Cf. *Report of Int. Conf. of Genetics*, 1906, p. 117.

FIG. 21.—CATTLEYA GASK
A pure R albino. Pure wh

ELLIANA ALBA. (p. 44)
ıite with yellow throat.

B representing blue sap-colour in the flower.
D representing intensification of sap-colour in the flower.
L representing reduction of sap-colour in the wings of the flower.

The presence and absence of these eight factors in various combinations and in their varied relations and interactions have given rise to numerous types and colour forms, most of which are familiar in gardens.

The following table will illustrate this so far as the eight factors are concerned.* Other garden forms not found in the table are no doubt due to the presence of other unit factors not yet isolated.

FACTORIAL TABLE FOR HABIT AND FLOWER COLOUR IN THE SWEET PEA (*Lathyrus odoratus*).

TPWCRBDL	Tall, purple standard with blue wings (e.g. *wild form*, *Purple Invincible*).
TPWCRBD	Tall, purple standard with purple wings (e.g. *Black Knight*).
TPWCRBL	Tall, white tinged with purple (e.g. *Lottie Eckford*).
TPWCRDL	Tall, red standard with blush wings (e.g. *Painted Lady*).
TPWCBDL	Tall, pure white (e.g. *Dorothy Eckford*).
TPWRBDL	,, ,, ,,
TPCRBDL	Tall, purple cream standard with blue cream wings.
TWCRBDL	Bush, purple standard with blue wings.
PWCRBDL	Cupid, purple standard with blue wings (e.g. *Captain of the Blues Cupid*).
TPWCRB	Tall, white tinged with purple (e.g. *Lottie Eckford*).
TPWCRD	Tall, red standard with red wings (e.g. *King Edward*).
TPWCRL	Tall, white tinged with red (e.g. *Lovely*).
TPWCBD	Tall, pure white (e.g. *Dorothy Eckford*).
TPWCBL	,, ,, ,,
TPWCDL	,, ,, ,,
TPWRBD	,, ,, ,,
TPWRBL	,, ,, ,,
TPWRDL	,, ,, ,,
TPWBDL	,, ,, ,,

* The remaining factors represent (1) dark leaf axil, (2) erect standard, (3) long pollen, (4) fertile anthers. The precise relationships between these remaining factors have not yet been fully worked out, but results so far have presented some interesting complications. For instance, a partial gametic coupling has been found (in coloured flowers) between the factors for dark axil and fertile anthers (pure white flowers have usually light axils). A partial gametic coupling also exists between the factors for long pollen and blue colour. Further a gametic repulsion between the factors for erect standard and blue colour has been discovered. There is also apparently a somatic coupling between erect standard and light wings and hooded standard and dark wings. In view of these complications these four factors may be for the present omitted.

TPCRBD	Tall, purple cream standard and wings.
TPCRBL	Tall, cream tinged with purple.
TPCRDL	Tall, red cream standard with blush cream wings (e.g. *Jeannie Gordon*).
TPCBDL	Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TPRBDL	,, ,, ,,
TWCRBD	Bush, purple standard and wings.
TWCRBL	Bush, white tinged with purple.
TWCRDL	Bush, red standard with blush wings.
TWCBDL	Bush, pure white.
TWRBDL	,, ,,
TCRBDL	Bush, purple cream standard with blue cream wings.
PWCRBD	Cupid, purple standard and wings (e.g. *Black Knight Cupid*).
PWCRBL	Cupid, white tinged with purple.
PWCRDL	Cupid, red standard with blush wings (e.g. *Pink Cupid*).
PWCBDL	Cupid, pure white (e.g. *White Cupid*).
PWRBDL	,, ,, ,,
PCRBDL	Cupid, pure cream standard with blue cream wings.
WCRBDL	Erect Cupid, purple standard with blue wings.
TPWCR	Tall, white tinged with red (e.g. *Lovely*).
TPWCB	Tall, pure white (e.g. *Dorothy Eckford*).
TPWCD	,, ,, ,,
TPWCL	,, ,, ,,
TPWRB	,, ,, ,,
TPWRD	,, ,, ,,
TPWRL	,, ,, ,,
TPWBD	,, ,, ,,
TPWBL	,, ,, ,,
TPWDL	,, ,, ,,
TPCRB	Tall, cream tinged with purple.
TPCRD	Tall, red cream standard and wings (e.g. *Queen Alexandra*).
TPCRL	Tall, cream tinged with red (e.g. *Evelyn Hemus*)
TPCBD	Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TPCBL	,, ,, ,,
TPCDL	,, ,, ,,
TPRBD	,, ,, ,,
TPRBL	,, ,, ,,
TPRDL	,, ,, ,,
TPBDL	,, ,, ,,
TWCRB	Bush, white tinged with purple.
TWCRD	Bush, red standard and wings.
TWCRL	Bush, white tinged with red.

TWCBD Bush, pure white.
TWCBL ,, ,,
TWCDL ,, ,,
TWRBD ,, ,,
TWRBL ,, ,,
TWRDL ,, ,,
TWBDL ,, ,,
TCRBD Bush, purple cream standard and wings.
TCRBL Bush, cream tinged with purple.
TCRDL Bush, red cream standard with blush cream wings.
TCBDL Bush, cream.
TRBDL ,, ,,
PWCRB Cupid, white tinged with purple.
PWCRD Cupid, red standard and wings.
PWCRL Cupid, white tinged with red (e.g. *Prima Donna Cupid*).
PWCBD Cupid, pure white (e.g. *White Cupid*).
PWCBL ,, ,, ,,
PWCDL ,, ,, ,,
PWRBD ,, ,, ,,
PWRBL ,, ,, ,,
PWRDL ,, ,, ,,
PWBDL ,, ,, ,,
PCRBD Cupid, purple cream standard and wings.
PCRBL Cupid, cream tinged with purple.
PCRDL Cupid, red cream standard with blush cream wings.
PCBDL Cupid, cream (e.g. *Primrose Cupid*).
PRBDL ,, ,, ,,
WCRBD Erect Cupid, purple standard and wings.
WCRBL Erect Cupid, white tinged with purple.
WCRDL Erect Cupid, red standard with blush wings.
WCBDL Erect Cupid, pure white.
WRBDL ,, ,,
CRBDL Erect Cupid, purple cream standard with blue cream wings.
TPWC Tall, pure white (e.g. *Dorothy Eckford*).
TPWR ,, ,, ,,
TPWB ,, ,, ,,
TPWD ,, ,, ,,
TPWL ,, ,, ,,
TPCR Tall, cream, tinged with red (e.g. *Evelyn Hemus*).
TPCB Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TPCD ,, ,, ,,
TPCL ,, ,, ,,
TPRB ,, ,, ,,
TPRD ,, ,, ,,
TPRL ,, ,, ,,

TPBD	Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TPBL	.. ,, ..
TPDL	.. ,, ,,
TWCR	Bush, white tinged with red.
TWCB	Bush, pure white.
TWCD	.. ..
TWCL	.. ..
TWRB	.. ..
TWRD	.. .
TWRL	.. ..
TWBD	.. ..
TWBL	,, ,,
TWDL	,, ,,
TCRB	Bush, cream tinged with purple.
TCRD	Bush, red cream standard and wings.
TCRL	Bush, cream tinged with red.
TCBD	Bush, cream.
TCBL	.. ,,
TCDL	.. ..
TRBD	,, ,,
TRBL	,, ,,
TRDL	,, ,,
TBDL	,, ,,
PWCR	Cupid, white tinged with red (e.g. *Prima Donna Cupid*).
PWCB	Cupid, pure white (e.g. *White Cupid*).
PWCD	.. ,, ,,
PWCL	.. .. ..
PWRB	.. ,, ,,
PWRD	.. ,, ,,
PWRL	.. . ..
PWBD	.. ,, ,,
PWBL	.. ,, ,,
PWDL	,, ,, ,,
PCRB	Cupid, cream tinged with purple.
PCRD	Cupid, red cream standard and wings.
PCRL	Cupid, cream tinged with red (e.g. *Alice Eckford Cupid*).
PCBD	Cupid, cream (e.g. *Primrose Cupid*).
PCBL	.. .. ..
PCDL	.. ,, ,,
PRBD	.. .. ,,
PRBL	.. .. ..
PRDL	.. .. ..
PBDL	,, ,, ..
WCRB	Erect Cupid, white tinged with purple.
WCRD	Erect Cupid, red standard and wings.
WCRL	Erect Cupid, white tinged with red.

WCBD	Erect Cupid, pure white.
WCBL	,, ,,
WCDL	,, ,,
WRBD	,, ,,
WRBL	,, ,,
WRDL	,, ,,
WBDL	,, ,,
CRBD	Erect Cupid, purple cream standard and wings.
CRBL	Erect Cupid, cream tinged with purple.
CRDL	Erect Cupid, red cream standard with blush cream wings.
CBDL	Erect Cupid, cream.
RBDL	,, ,,
TPW	Tall, pure white (e.g. *Dorothy Eckford*).
TPC	Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TPR	,, ,, ,,
TPB	,, ,, ,,
TPD	,, ,, ,,
TPL	,, ,, ,,
TWC	Bush, pure white.
TWR	,, ,,
TWB	,, ,,
TWD	,, ,,
TWL	,, ,,
TCR	Bush, cream tinged with red.
TCB	Bush, cream.
TCD	,, ,,
TCL	,, ,,
TRB	,, ,,
TRD	,, ,,
TRL	,, ,,
TBD	,, ,,
TBL	,, ,,
TDL	,, ,,
PWC	Cupid, pure white (e.g. *White Cupid*).
PWR	,, ,, ,,
PWB	,, ,, ,,
PWD	,, ,, ,,
PWL	,, ,, ,,
PCR	Cupid, cream tinged with red (e.g. *Alice Eckford Cupid*).
PCB	Cupid, cream (e.g. *Primrose Cupid*).
PCD	,, ,, ,,
PCL	,, ,, ,,
PRB	,, ,, ,,
PRD	,, ,, ,,
PRL	,, ,, ,,
PBD	,, ,, ,,

PBL	Cupid, cream (e.g. *Primrose Cupid*).
PDL	,, ,, ,,
WCR	Erect Cupid, white tinged with red.
WCB	Erect Cupid, pure white.
WCD	,, ,,
WCL	,, ,,
WRB	,, ,,
WRD	,, ,,
WRL	,, ,,
WBD	,, ,,
WBL	,, ,,
WDL	,, ,,
CRB	Erect Cupid, cream tinged with purple.
CRD	Erect Cupid, red cream standard and wings.
CRL	Erect Cupid, cream tinged with red.
CBD	Erect Cupid, cream.
CBL	,, ,,
CDL	,, ,,
RBD	,, ,,
RBL	,, ,,
RDL	,, ,,
BDL	,, ,,
TP	Tall, cream (e.g. *Hon. Mrs. Kenyon*).
TW	Bush, pure white.
TC	Bush, cream.
TR	,, ,,
TB	,, ,,
TD	,, ,,
TL	,, ,,
PW	Cupid, pure white (e.g. *White Cupid*).
PC	Cupid, cream (e.g. *Primrose Cupid*).
PR	,, ,, ,,
PB	,, ,, ,,
PD	,, ,, ,,
PL	,, ,, ,,
WC	Erect Cupid, pure white.
WR	,, ,,
WB	,, ,,
WD	,, ,,
WL	,, ,,
CR	Erect Cupid, cream tinged with red.
CB	Erect Cupid, cream.
CD	,, ,,
CL	,, ,,
RB	,, ,,
RD	,, ,,
RL	,, ,,
BD	,, ,,

BL	Erect Cupid, cream.
DL	,, ,,
T	Bush, cream.
P	Cupid, cream (e.g. *Primrose Cupid*).
W	Erect Cupid, pure white.
C	Erect Cupid, cream.
R	,, ,,
B	,, ,,
D	,, ,,
L	,, ,,
All absent	Erect Cupid, cream.

It will be observed that the various relations and interactions between the factors in the case of the sweet pea are quite different from those in the snapdragon.

Thus T with P gives the ordinary "Tall" habit, T alone gives "Bush" habit, P alone gives the ordinary "Cupid" habit, while absence of both T and P gives the form "Erect Cupid." Presence of W gives a pure white ground in the flowers, while absence of W gives a cream ground.

C with R gives red colour in the flower, while in the absence of *either* C *or* R the flowers are pure white or cream, according to the presence or absence respectively of W.

B is only manifested in the presence of both C and R giving purple colour.

D is only manifested in the presence of both C and R giving intensified colour.

L is only manifested in the presence of C, R, and D together, giving light-coloured wings.

As in the case of the snapdragon, only a single presence of the eight factors is given in the above table for the sake of simplicity. In accordance with MENDEL'S law it will, of course, be understood that a pure-bred form would have a double presence of each factor, thus the pure-breeding wild form would be constituted TTPPWWCCRRBB DDLL and so on with the others. So far, however, the single presence of these eight factors apparently gives the same visible result as the double presence, but the breeding results would, of course, be quite different. All the above combinations of factors may occur with either a double or a single presence of each factor in various combinations in accordance with MENDEL'S law.

The results of these experiments with the snapdragon and the sweet pea show that the numerous and varied garden forms that have arisen from time to time under cultivation are simply due to the dropping out of certain unit factors. It would appear, therefore, that the evolution of the snapdragon and the sweet pea under cultivation, so far from being an increase of complexity, as one might

naturally assume, is in reality merely a simplification of the original wild form. The philosophical significance of this fact cannot be dealt with here, but it is evident that the consequences of its application will be far-reaching indeed.

The factorial tables of the snapdragon and the sweet pea given above will, it is hoped, assist breeders to arrange their matings so as to secure the results desired.

"Albino" Orchids.

Recent results show that when true albino orchids (*i.e.* with no trace of purple sap colour) are crossed, the offspring may be all albinos, all coloured reversions, or both albino and coloured forms may be raised from the same capsule.* For instance, *Paphiopedilum callosum Sanderae*, selfed by Mr. N. Cookson, produced true albinos. Another batch, raised by Mr. T. Statter, also produced true albinos (fig. 22). *P. Lawrenceanum Hyeanum*, selfed by Mr. N. Cookson, produced nine plants, eight of which reproduced the true albino, while one plant is said to have reverted to an ordinary coloured form of *P. Lawrenceanum*. This apparent exception is remarkable, and a repetition of this experiment with larger numbers would be useful (fig. 23). *P. Lawrenceanum Hyeanum* × *P. callosum Sanderae*, raised by Messrs. Charlesworth in 1900, produced the albino hybrid *P.* × *Maudiae*, all the plants of which have so far proved to be true albinos. Another batch raised by Baron Schröder in 1907 also produced true albinos (fig. 24). *P.* × *Maudiae* × *P. insigne Sanderianum* (fig. 25), raised by Lieut.-Col. Holford in 1908, produced the albino hybrid *P.* × *Rosettii*, sixteen plants of which have so far flowered, all apparently true albinos. It may be noted here that while *P. insigne Sanderianum* so far appears to behave as a true albino, yet the presence of some dark-coloured hairs at the base of the petals suggests that this variety may possibly be a tinged albino like *P. insigne Sanderae*. It would be interesting to know if the hybrid *P.* × *Rosettii* also has those dark-coloured hairs (fig. 26). *P. callosum Sanderae* × *P. bellatulum album* (fig. 27), raised by Mr. Cookson in 1907, produced the coloured hybrid *P.* × *Wottonii*, twenty-five plants of which have flowered, all apparently sap-coloured like the typical hybrid between *P. callosum* and *P. bellatulum*. *P. Lawrenceanum Hyeanum* × *P. bellatulum album*, raised by Mr. Cookson, produced the coloured hybrid *P.* × *Lawrebel*, resembling the typical hybrid between *P. Lawrenceanum* and *P. bellatulum*. *Cattleya Mossiae Wageneri* (fig. 20), selfed by Messrs. Charlesworth in 1907, produced a true albino with no trace of sap colour. *C. Mossiae Wageneri* × *C. Gaskelliana alba* (fig. 21), raised by M. Jules Hye, produced three true albinos—viz. *C.* × *Hyeae*, *C.* × *Hyeae Suzanne* (fig. 28), and *C.* × *Hyeae Jungfrau*. *C. Mossiae Wageneri* × *C. intermedia alba* (fig. 30), raised by Colonel Holford in 1906, produced the albino hybrid *C.* × *Maciayi Undine* (fig. 29),

* For details see *Gardeners' Chronicle*, 1909, i. p. 81.

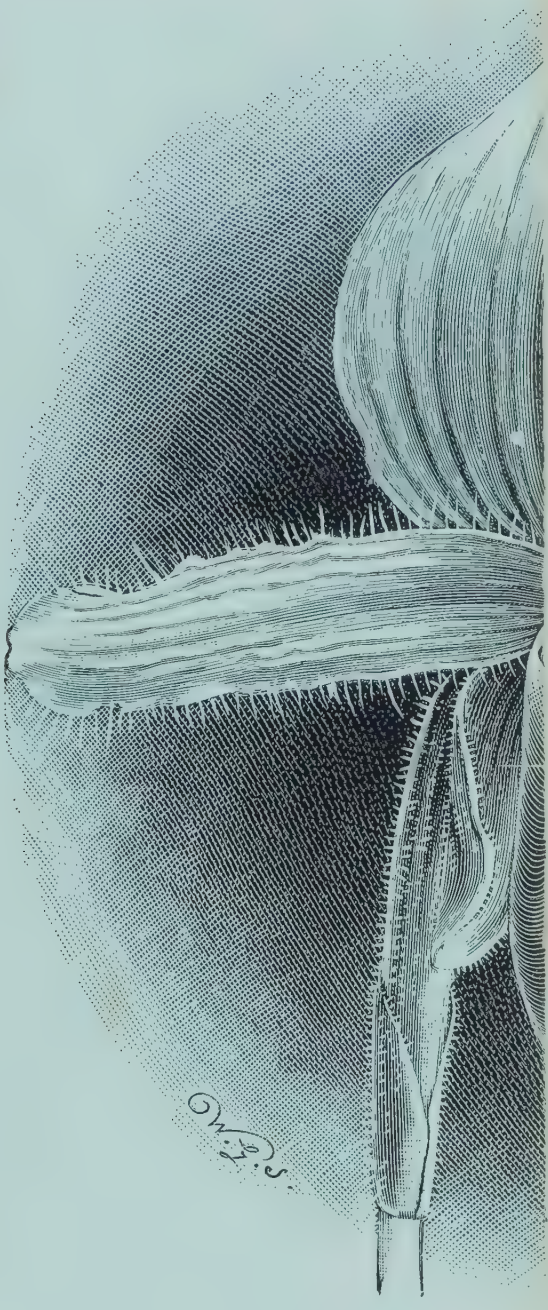
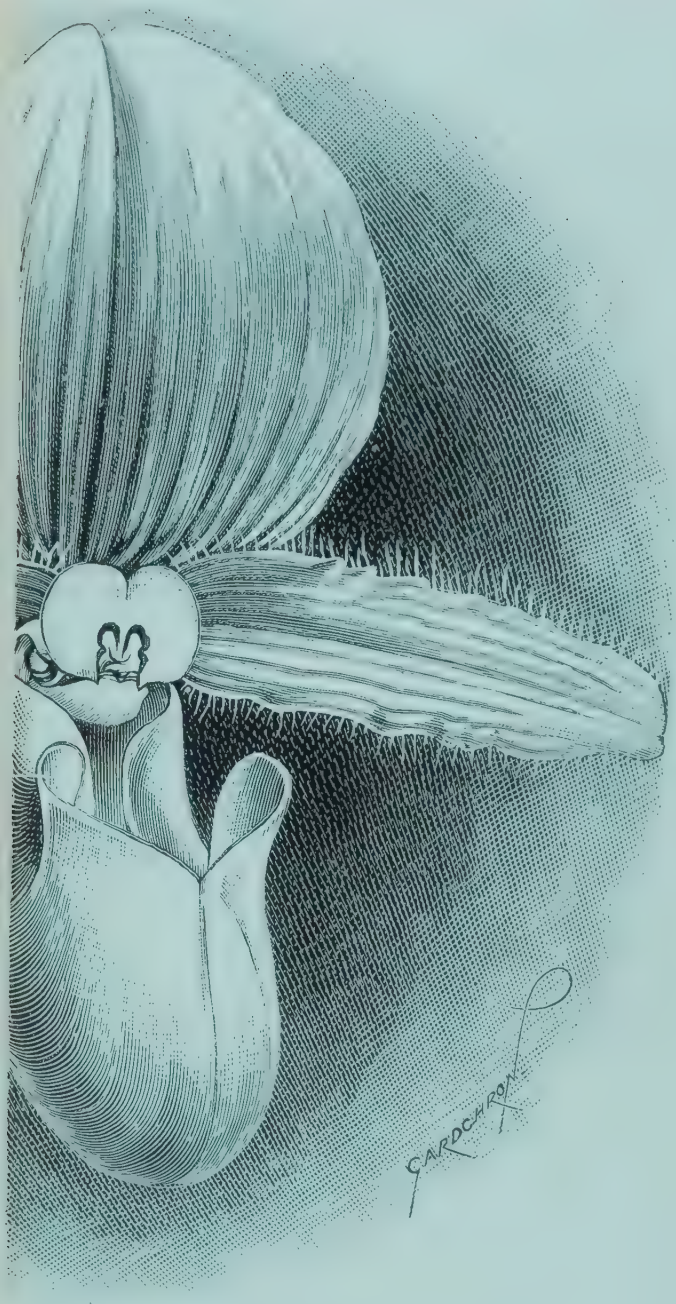


FIG. 23.—PAPHIOPEDILUM LAWRE
A pure R albino. One of the



ɔCEANUM HYEANUM. (*Gard. Chron.*) (p. 44)
original seedlings raised by Mr. Cookson.

fourteen plants of which flowered true albinos. In 1908 three true albinos of the same parentage were raised by Mr. R. G. Thwaites, also one by Sir Trevor Lawrence and one by Messrs. Veitch. *C. Schroederae alba* (fig. 34) × *C. intermedia alba*, raised by Mr. Cookson, produced in 1907 the coloured hybrid *C.* × *Thayeriana*, similar to the hybrid raised by Mr. Orpet between the typical *C. intermedia* and *C. Schroederae alba*. *C. Gaskelliana alba* × *C. Harrisoniana alba* (fig. 31), exhibited by Mr. Thwaites in 1908, produced the coloured hybrid *C.* × *Williamsiae*, four plants of which had coloured

Fig. 24.—Paphiopedilum × Maudiae. (*Orchid Review.*) (p. 44)
A pure R albino.

flowers like the typical hybrid between *C. Gaskelliana* and *C. Harrisoniana*. *C. Gaskelliana alba* × *C. Warneri alba* (fig. 32), raised by M. Peeters in 1904, produced the hybrid *C.* × *Peetersiae Myra* (fig. 33), five of which were true albinos with pure white flowers and green leaves, and two were coloured, having lilac-purple flowers with purple margins to the leaves.

These results are similar to those obtained in the Mendelian experiments of Professor Bateson, Mr. R. C. Punnett, and Miss Saunders with sweet peas and stocks.

It is evident, therefore, that in orchids, as in sweet peas and stocks, the appearance of sap-colour depends on the simultaneous presence of two complementary colour factors, which may be termed C and R.

If both the colour factors C and R are present the sap is coloured; if either C or R is absent, the sap is colourless and the plant is an albino. Consequently different albinos may carry different colour factors; some may be C albinos, carrying the C factor, while others may be R albinos, carrying the R factor.

For instance, in the Cypripedium group results show that *Paphiopedilum callosum Sanderae*, *P. Lawrenceanum Hyeanum*, *P.* × *Maudiae*, and probably *P. insigne Sanderianum* and *P.* × *Rosettii*,

FIG. 25.—PAPHIOPEDILUM INSIGNE SANDERIANUM. (*Orchid Review.*) (p. 44)
Probably a pure R albino.

may be regarded as R albinos, while, on the other hand, *P. bellatulum album* may be regarded as a C albino.*

Similarly in the Cattleya group, for instance, *Cattleya Mossiae Wageneri*, *C. Gaskelliana alba*, *C.* × *Hyeae Suzanne*, *C. intermedia alba*, *C.* × *Hyeae Jungfrau*, *C.* × *Mackayi Dusseldorfii*, *C.* × *Mackayi Undine*, and *C.* × *Peetersiae Myra* may be regarded as R albinos, *C.* × *Peetersiae Myra* being an impure R, having only a single presence of R, the others being pure RR with a double presence of R. On the

*It will of course be understood that C and R are purely arbitrary symbols which conveniently serve to distinguish the two colour-factors from each other.

other hand, *C. Harrisoniana alba*, *C. Schroederae alba*, *C. Warneri alba*, and probably *C. Mendelii alba* may be regarded as C albinos, *C. Warneri alba* being an impure C with only a single presence of C, the others being pure CC with a double presence of C.

To the orchid breeder who wishes to raise new and improved forms of valuable albinos by crossing, such knowledge is most useful. He will know, for instance, that all the R albinos will breed true albinos amongst themselves, whether selfed or crossed, and also that all the C albinos will breed true, selfed or crossed. On the other hand, he

FIG. 26.—PAPHIOPEDILUM × ROSETTII. (*Orchid Review.*) (p. 44)
Probably a pure R albino.

will know that if he crosses an R albino with a C albino he will get coloured reversions which, of course, he does not want. The orchid breeder will take care, therefore, to keep the C albinos distinct from the R albinos. This raises a question of great importance to the practical breeder. MENDEL'S law shows that individual albinos of the same species, to all outward appearance identical, may differ from one another in their germinal constitution and consequently give different results when bred from. It is, therefore, of prime importance for orchid breeders to adopt some simple method of identification for individual albinos, whether imported or raised from seed in gardens.

A distinct name would hardly be convenient for individuals which

to the eye appear exactly alike, but identification might be assisted by putting the name of the importer or raiser in brackets after the name of the albino, together with a number showing the order of its appearance. For instance, the albino *Paphiopedilum callosum Sanderae* was first flowered from an importation of Messrs. Sander in 1894, and this plant (and its many offshoots) might be called (Sander 1). Another individual of this albino appeared in an importation of Messrs. Low in 1904, and might be called (Low 1), and so on.

The hand-raised seedlings of these albinos might be similarly distinguished, thus (Cookson 1), (Statter 1), and so on.

In this way all the individuals of any particular albino could be distinguished for stud purposes. The same principle might be adopted

Fig. 27.—Paphiopedilum bellatulum album. (*Orchid Review.*) (p. 44)
A pure C albino.

for special individual coloured forms, and indeed for garden plants generally, to the great advantage of breeders and growers. Standard stud individuals of known germinal constitution would then have a definite value, and their propagation and distribution would be more profitable to all concerned. Once the genetic properties of the individual plant are ascertained, all future breeding results from that plant (and its distributed offshoots) could be foreseen by the aid of Mendel's law.

Mendelism and the Seed Grower.

To none will the consequences of Mendelism appeal more strongly than to the professional seed grower. The prosperity—nay, the very existence—of his business depends on growing true stocks of seed.

FIG. 29.—CATTLEYA × MACKAYI U
A pur

NDINE. (*Journal of Horticulture.*) (p. 44)
e R albino.

FIG. 30.—CATTLEYA INTERMEDIA ALBA. (p. 44)
A pure R albino.

For centuries the seed grower has relied on "rogueing" to ensure a true crop. The process of "rogueing" however, though temporarily

FIG. 31.—CATTLEYA HARRISONIANA ALBA. (*Garden.*) (p. 45)
A pure C albino.

effective, involves in many cases a serious annual expenditure of trained and expensive labour, without permanently achieving its object. It

is in this respect that Mendelism comes to the rescue of the modern seed grower. By the adoption of the Mendelian method of breeding from single individuals separately and selecting one only of these to perpetuate the true stock, the necessity for "rogueing" is practically

FIG. 32.—CATTLEYA WARNERI ALBA. (*Garden.*) (p. 45)
An impure C albino.

dispensed with, and the true stock is permanently established without further selection, to the great advantage of the seed grower.

According to the old method a certain stock or strain was built up by the mass selection of several or many individual stock plants, and allowing them to breed together, the consequence being that some individuals breed true while others do not, and each strain or stock, even

when carefully isolated, throws annually varying percentages of "rogues." The annual elimination of these "rogues" may or may not, according to chance, purify the strain in course of time.

The adoption of the Mendelian system of founding a true stock on a single individual may appear to be a simple matter, but in reality it is somewhat difficult to carry out in practice on a large scale, and extensive operations require a good deal of careful organization to be truly effective. In order to ensure the final selection of a single true breeding individual, many single individuals have to be selected. Each one of these must be so disposed, that during the flowering season all are strictly isolated not only from one another but from anything else of a similar nature. The seeds of each individual must be separately harvested, stored, and tested in the trial grounds, and so on.

But once the true-breeding individual is found, its stock and seed will, with strict isolation, be permanently established, without any further selection or "rogueing," and can be increased annually to any extent.

It is obvious that apart altogether from the question of the recognition of the advantages of the Mendelian system of breeding, there are certain practical difficulties that have to be faced. In any extensive operations the initial expenses of carrying out the Mendelian system of breeding are bound to be heavy, and early returns are not to be expected. Later returns, however, should fully compensate the grower.

Old methods of cultivation die hard, and in the circumstances, it is not surprising that professional seed growers generally have hesitated to adopt the new methods, even in the few cases where they clearly recognize the great advantages of the Mendelian system. Once a beginning has been made, however, there will be no looking back, for there is no doubt that the Mendelian system of breeding has come to stay.

Mendelism stands or falls by the purity of its cultures. No other method of plant-breeding is known which can guarantee 100 per cent. of purity in its cultures. When buyers once realize that such a cherished dream is practicable there will be no more "rogues," and Mendelian seeds will be the only profitable seeds to grow.

Fig. 34.—Cattleya
A pure C albino. F

SCHROEDERAE ALBA. (p. 45)
ure white with yellow throat.

SOME INSECT PESTS AFFECTING CULTIVATED PLANTS IN THE WEST INDIES.

By Robert Newstead, M.Sc., A.L.S., &c.

[Lecture read December 1, 1909.]

In dealing with the insect pests affecting cultivated plants in the West Indies I should like, in the first instance, to bear testimony to the excellent results which have been achieved by the Imperial Department of Agriculture—until recently under the able guidance of Sir Daniel Morris, and the former official Entomologist, Mr. Maxwell Lefroy, and now of Mr. Ballou.

I have no hesitation in saying that the various publications which have emanated from this department are of a very high standard of excellence, and that they take first rank among the innumerable publications which have been issued by similar institutions in other parts of the world.

Although the publications referred to were intended primarily for the planters and horticulturists of the Lesser Antilles, they have proved of inestimable value to agriculturists in those other West Indian Islands —for instance, the Greater Antilles—which are not so fortunately placed in having an Economic Entomologist to advise them regarding the methods of prevention and control of the innumerable insect pests which, unfortunately, have caused so great a loss to economic plants under cultivation in these lands.

Seeing that so much has already been accomplished in regard to the West Indian insect pests I feel that it is unnecessary to traverse the ground which has been so thoroughly investigated. I propose, therefore, to confine my remarks to some of those insects which are injurious to economic plants in the Island of Jamaica; and more especially those which came under my own observation during an expedition sent out by the Liverpool School of Tropical Medicine towards the end of the year 1908.

I have pleasure in adding, however, that the subject of Economic Entomology is now receiving every possible attention by the Director of Agriculture for Jamaica, the Hon. H. H. Cousins, and his Assistant, Mr. E. J. Wortley, in whose able hands much good work has already been done. I must here tender to these gentlemen my sincere thanks for the kind and valued assistance which they gave during my stay in the island, as without such help it would have been impossible to have accomplished so much in so short a space of time.

Ants Destroying the Flowers of the Cacao.

So far as one could gather, the most destructive insect pest to the cacao in Jamaica is a small black "fire ant," apparently a Myrmicid

of the genus *Solenopsis*. It has been impossible so far to get this insect identified in this country, but it is in all probability known to the American entomologists. In its nest-building habits it resembles the terrestrial species of *Formica* and other allied genera found in the British Isles and in other parts of the world. The nests of the species in question were, however, generally constructed so that they were partly protected from the direct rays of the tropical sun, being sometimes completely overshadowed by the cacao trees. In the Chapelton district their nests were found scattered all over the plantations, and the ants were found foraging about the branches of a very large percentage of the cacao trees. The nests were often placed close to the trees on which the ants were found wandering about; but in several instances these structures were also found on the outskirts of the plantation without apparently any regard to the distance the ants had to travel in order to reach their feeding-grounds.

Many of the trees were found swarming with these insects, but it was some time before one could obtain any clue to the object of their search. Eventually it was discovered that they were attracted by the "honey dew" secreted by small colonies of plant lice (*Aphidæ*) which were feeding upon the leaves of the cacao, generally speaking, at some considerable distance from the main stem and branches. In order, apparently, to screen their movements, the ants constructed for themselves a narrow gallery or covered way leading from the ground up to a point where the branches diverge from the main stem or trunk or sometimes even to a greater elevation. The gallery was in all cases formed of pellets of earth, of a very fragile nature and easily removed. Having reached the main branches of the cacao under cover the insects sought further protection by forming larger covered ways among the dead flowers which had accumulated in the bifurcations of the branches and also among the clusters or "cushions" of flowers upon the main branches. In the latter case the pedicels of the flowers had apparently been injured in such a way as to prevent them falling from the tree, so that they remained *in situ*, shrivelled and dry, for indefinite periods, forming excellent retreats for the ants.

From these shelters they seemed to be constantly moving to and fro among the upper branches of the cacao, seeking for the sweet juice secreted by the aphides. The dead flower-clusters were easily removed and, although carefully examined, did not appear to be cemented together by soil or other substances. At first one suspected that the flowers had died from some unknown disease, but after careful investigation one came to the same conclusion as the planter, that they were destroyed by the ants. This was confirmed by the fact that the dead "cushions" always occurred upon the lower portions of the main branches, and that they were invariably tenanted by these insects. The loss occasioned in this way was often considerable, and several methods of checking their ravages had been attempted with, unfortunately, but little success.

A mixture of lime, kerosene, turpentine, &c., had been tried as a

preventive, but had proved a failure. Gas lime applied to the earth near the tree was effectual for a time, but on losing its offensive odour became useless. The system of grease-banding, in use in this country and elsewhere, was recommended for the pest, and as both tar and grease were available it was suggested that this might be used as a substitute for the proprietary article manufactured for such purposes. The result has not yet been communicated to me, and I am still in doubt as to whether such a compound will retain its viscosity for a sufficiently long period in the tropics, and thus act as a barrier to the inroads of the ants. This preparation should be applied to a strip of grease-proof paper to prevent direct contact with the bark of the tree.

Larvæ of a Wood-Boring Beetle Injuring the Cacao Tree.

The larva of a longicorn beetle was found tunnelling the bark and wood of cacao trees in the Chapelton district. Its occurrence was extremely local, and so far as one could gather was, fortunately, not of a serious nature. All the examples discovered had confined their attacks to the lower portions of the stems or main branches and always tenanted a spot which showed evident signs of either previous injury or decay. The subject requires further investigation, though it is doubtful whether the insect can, for the present at least, be looked upon as a serious pest.

As a means of prevention, tar should be applied to the ends of all freshly cut branches or other wounds produced by pruning or by other means, as a precautionary measure against the attacks of this insect.

Girdler-Weevil of the Orange and Cacao (*Prepodes vittatus*).

A pest of a much more serious nature than the larva of the longicorn beetle already referred to, is a brilliantly coloured weevil (fig. 35) belonging to the Rhynchophorus section of the Coleoptera. The larva of this handsome insect is a very serious pest to both the orange and cacao, and its methods of attack are very striking and distinctly characteristic. The grubs occur, invariably, just below the surface of the ground, and at a point usually immediately above the junction of the roots with the main stem of the tree; and they eat away every portion of the bark, right through the cambium layer, often completely girdling the stem. Every trace of the bark may be removed for a distance of two inches so that a complete broad ring or girdle is formed (fig. 36) resulting in the ultimate death of the tree. Cacao trees thus attacked sometimes throw out adventitious roots just above the girdle, and in such cases the tree may survive for a time, but it rarely, I believe, recovers.

The complete life-cycle of this pest has not yet been fully traced out, but Mr. E. J. Wortley has been successful in rearing the beetles from larvæ taken from the roots of orange trees. The grub or larva

(fig. 35) is footless, and whitish in colour, measuring approximately one inch in length when fully matured. The adults are very handsome insects and are closely related to the so-called "diamond beetles."

At the present moment one can say very little regarding the geographical distribution of this pest outside the Island of Jamaica. There is, so far as one can find, no record of its occurrence as a pest in the Lesser Antilles, though several allied snout-beetles occur in Barbados—the weevil-borers of the sugar cane (*Sphenophorus sericeus* and *Diaprepes abbreviatus*) and the grain or granary weevil (*Calandra oryzae*). In Dominica and Montserrat is the destructive palm-weevil (*Rhyncophorus palmarum*); and in Trinidad the banana is attacked by *Sphenophorus sordidus*.

As to the distribution of the girdler-beetle in Jamaica one has very little information to rely upon, but it evidently occurs in widely separated portions of the island, so that in all probability it is generally distributed. But it is satisfactory to note that it was not observed

FIG. 35.—GIRDLER WEEVIL (AND LARVA) OF ORANGE AND CACAO (PREPODES VITTATUS). (Natural size.)

in many of the large cacao plantations and in two extensive orange groves which I inspected during the months of December and January (1908-9).

The most effective measure for the prevention of the attacks of the insect is removal of the surface soil from the base of the tree trunks, replacing it with loose rock chippings, or small stones. Unfortunately, the injury is often done before the planter is aware of the presence of the pest. Plantations of cacao or orange groves found harbouring the grubs should, therefore, be carefully examined, and if the infestation is found to be extensive it may be necessary to treat all of the healthy trees in the way that has been indicated. Bisulphide of carbon, if obtainable in large quantities and at a cheap rate, would doubtless prove effective in destroying the grubs.

A layer of gas lime spread round the stem of the trees might well act as a preventive against the beetles laying their eggs at the foot of the plants. But even if it were proved experimentally to be

FIG. 36.—STEM OF YOUNG CACAO TREE GIRDLED BY THE LARVÆ OF PREPODES VITTATUS. AN ADVENTITIOUS ROOT HAS DEVELOPED ABOVE THE GIRDLE. (Natural size.)

(*To face page* 56.)

Fig. 37.—Leaves of Para Rubber (Hevea brasiliensis) riddled by slugs.. (Slightly reduced.)

FIG. 50.—PARROT-BILLED BLACKBIRD (CROTOPHAGA ANI).
From a specimen prepared by the author.

FIG. 39.—SNOW-SCALE (DIASPIS AMYGDALI) ON THE STEMS OF YOUNG CASTILLOA TREES.

an efficient measure of prevention, it would be quite impossible to adopt this method in places which are situated at great distances from the railway.

Slugs Destroying Para Rubber Plants, *Hevea brasiliensis*, &c.

In certain portions of the Island of Jamaica both the Para Rubber (*Hevea brasiliensis*) and the Central American Rubber (*Castilloa elastica*) are being planted in considerable quantities. At Chapelton about 10,000 young plants of the former, mostly from one to three and a half years, though not a few of greater age, have been established, chiefly in the cacao plantations. On the same estate about 1000 Castilloa are also under cultivation, and, as in the former case, are intended ultimately to serve as shade-trees for the cacao, as well as for the production of rubber.

Quite a large percentage of the young Para trees had their foliage badly injured (fig. 37) by a large flat slug which occurs in great numbers, especially in the Chapelton district.

Previous to my visit all efforts to discover the cause of the injury to the trees in question had failed, and this was scarcely to be wondered at, seeing that the slug, like most of its congeners, proved to be a night feeder, and that it concealed itself during the day sometimes at a considerable distance from the scene of its nocturnal feasts. Having failed to trace the depredator during the day, arrangements were made to inspect the plants late at night, when one had no difficulty in discovering many of the huge slugs feeding upon the leaves. In one instance three examples occurred together on a young tree whose crown of leaves was scarcely two feet from the ground. Subsequently a careful search was made for the diurnal retreats of these animals, and with the aid of a native negro they were found concealed beneath the moist "trash" covering the stems of the bananas. They were not found elsewhere, though they must of necessity find other suitable places of concealment where similar conditions as to moisture prevail.

Though the slugs showed a marked partiality for the Para rubber leaves, it was quite evident that other trees were also attacked. The leaves of the older cacao trees had not escaped their ravages, and the Bissey nut or Kola (*Cola acuminata*) also showed evident signs of their attacks, sometimes at a considerable distance from the ground. The plants which suffered most were the young *Hevea brasiliensis*, especially those which had been planted a few months previously.

The writer had no opportunity of testing any measures for the control of this pest; but the following remedies were suggested:—

1. Spraying with Paris Green (*poison*) and water, the strength to be determined by experiments.

2. Dusting with Paris Green and lime in the proportion used for cotton; normal strength, one part Paris Green to six of lime.

3. Tying barriers or bands of cotton wool round the stems of the young trees.

Personally I should favour the application of cotton-wool barriers, which, if properly applied, would effectually prevent the slugs from reaching the leafy crowns of the plant. The band should be applied and secured with string at a height of one foot or more from the ground, and should be at least two inches thick below the tie. The plants in question must be kept free from weeds, so as to prevent the access of the slugs by any other path than the stems of the rubber plants.

Cabbage Butterfly (*Pieris sp.*).

One of the commonest butterflies met with during my stay in the island was a large white species which is very closely allied to the "cabbage butterfly" (*Pieris brassicae*) of this country. It seemed very generally distributed over the whole island, but was nowhere so abundant as in the swamps near Port Henderson, where it was seen flitting about over certain favourite plants (*Portulaca sp.*, &c.), frequently congregating together in scores or hundreds, presenting to the stranger a very remarkable sight. Its natural food-plant was not observed, but larvæ were found infesting cultivated crops, chiefly cabbage, to which it seemed partial, and to which also it was very destructive in the parish of St. Andrew. Examples of this butterfly were bred in the laboratory from caterpillars which were taken from cabbage under cultivation in the garden of Constant Spring Hotel. This was during the month of December. In January there was a marked diminution of both caterpillars and the butterfly. The larva feeds up very quickly, though the exact period was not ascertained, and the pupal stage lasts but a week or ten days, possibly less under more favourable conditions than those under which they were kept in the laboratory.

The infested plants had been dusted over at regular intervals with an insecticide prepared by an American firm. That it was effectual there can be no doubt; but on discovering that it consisted almost entirely of powdered hellebore the writer advised the cultivator to discontinue its use, fearing that it might lead to serious results, as large quantities of the vegetable were being served at the table almost daily, often, as the writer observed, with evident traces of the insecticide still in the axils of the leaves.

A Pyralid Moth Injuring Beetroot.

Beetroots seemed particularly subject to the attacks of the caterpillar of a moth belonging, so far as one could gather, to one of the small Pyralid group. In two localities the crops had been rendered leafless by this pest. Unfortunately, time did not permit one to rear the perfect insect, but this could be easily accomplished, and with little trouble the whole life-cycle could be worked out.

In this case a poisonous insecticide might be used with comparative safety; and possibly Paris Green, at the rate of one ounce to twenty gallons of water, will be found effective.

Sweet Potato Weevil* (*Cylas formicarius*, Fab.).

This very characteristic insect (fig. 40) is a pest of greater or less importance in nearly all countries where the sweet potato is under cultivation. It has been recorded from Africa, India, China, Madagascar, Louisiana and Florida in the United States, and is said to be a common pest in Cuba. Now, unfortunately, one has to record its occurrence in Jamaica, though, so far as can be gathered, it is not generally distributed in the West Indian Islands. Its introduction into the United States was doubtless from Cuba, and the probability is that before very long we shall find that it has been introduced from the same country into the other adjacent islands.

Fig. 40.—Sweet Potato Weevil, male and female. (Natural size and enlarged.)

The larva or grub is a small, white, legless creature, which passes the whole of its existence in eating or cutting tunnels in the tubers, filling them with rejectamenta, which ultimately leads to the decay of the potato. Pupation takes place in the tuber, the whole life-cycle occupying about four weeks; and as one generation follows another in rapid succession, the increase is often so great as to render the cultivation of the sweet potato almost impossible. The only practical measures so far devised for dealing with this pest are:—

1. To dig up the tubers as soon as they are found to be infested, and feed those containing insects to stock.

2. The complete removal of all tubers, as any that may be left in the ground will serve as breeding-places for the insects.

* See *Annual Report, Dept. Agriculture*, Washington, 1879, p. 249, for article on this pest. I am greatly indebted to Mr. E. J. Wortley for examples of this curious weevil.

3. Consecutive crops of sweet potatos should not be grown on infested ground.

4. Tubers that are planted deeply are said to be more readily attacked than those planted near the surface.

5. The importations of tubers should be subject to quarantine, and they should be thoroughly examined by a competent authority before they are admitted into a new country.

Cotton-Stainer (*Dysdercus ? andreae*).

The only cotton-stainer observed in Jamaica is apparently the rather widely distributed West Indian species *Dysdercus andreae* (Linn.). This insect literally swarmed in a neglected cotton-field in the parish of St. Andrew; and in many instances the bolls were almost covered by these brightly-coloured pests. It is scarcely necessary, therefore, to add that the crop was seriously injured by them. It should be pointed out, however, that the field in question had been so grossly neglected that at least one-third of the crop had been completely destroyed by noxious weeds. These conditions were taken as evident signs that the cultivator had lost all interest in the work and had let the ground lapse into a semi-wild state. Questioned as to the destruction wrought by the cotton-stainer, the owner stated that comparatively little harm was done by these pests, providing always that the insects in question were removed from the cotton before the process of ginning. That this statement was inaccurate was proved by an examination of the bolls which showed clearly that they were seriously injured, being for the most part undersized, and the fibre being also brittle and distinctly discoloured.

During the dry season in Jamaica there is evidently a succession of broods and these broods overlap, so that insects in all stages are found living together sometimes upon a single cotton boll.

In the West Indies the following methods of control have been adopted:—

1. Baits consisting of little heaps of cotton-seed or pieces of sugar-cane placed at close intervals between the plants. The insects thus collected together are best killed by dropping them into a bucket containing a small quantity of water with a little kerosene added.

2. The second method, usually adopted when the bolls are well formed, is to jar or shake the plants over a kerosene tin or bucket containing the mixture mentioned in 1.

The insects usually fall from the plants on the least disturbance, so that no great force is needed to dislodge them. Jarring or shaking injudiciously done, as it would be in all probability by the West Indian native, might cause serious injury to the plants, etc. The employment of coolies or strict supervision of the native by a responsible person would be necessary.

Natural enemies.—Ballou* says that "Cotton-stainers appear to be remarkably exempt from the attacks of natural enemies," but he

* *Journ. of the Imp. Agric. Dept. for the W. Ind.*, vol. vii. p. 78.

adds that he has observed an adult lady-bird (*Megilla maculata*) eating a young larva of *Dysdercus andreae*. It would seem, however, that this is the only authentic instance of a predaceous insect attacking any member of the genus *Dysdercus*. Neither is there apparently any record of birds or other vertebrates having been found to feed upon these bugs. It may be of some interest, therefore, if not of economic importance, to state that while in Jamaica I found examples of *Dysdercus andreae* in the stomach of a Parrot-billed Blackbird (*Crotophaga ani*) (fig. 38). It would appear from the few dissections which were made that this bird is almost, if not quite, omnivorous in its diet, as the following record of the food-contents of three stomachs of these birds will show:—

Locality.—Stony Hill, St. Andrew, January 4, 1909.

No. 1. Contents.—Almost filled with portions of the nests (cells, larvæ, and pupæ) of the common paper-building wasp (*Polistes crinita*); there were also a few skins of moth larvæ, and one spinose skin of the larva of a Nymphalid butterfly.

1 beautifully coloured beetle (*Homophoeta equinoctialis*, Linn.) of the Chrysomelid group, having a yellow thorax, with deep-violet wing-cases bearing eight large white spots.

1 weevil (*Rhyncophorus* sp.).

3 specimens of the pupal stage of the bright orange-red "Cotton-stainer" (*Dysdercus* sp.).

1 small mollusc (*non det.*).

1 purple berry of the noxious Lantana.

3 hard brown seeds (*non det.*).

1 Texas-fever tick (*M. annulatus australis*), a partly engorged female.

Locality.—Stony Hill and Constant Spring, St. Andrew, January 14, 1909.

No. 2. Contents.—Large fragments of the common "green stink-bug" (*Loxa flavicollis*, Drury), in both immature and adult stages, the stomach being well filled with the remains of this insect.

No. 3. Contents.—2 almost perfect examples of the "green stink-bug" (*L. flavicollis*) and many fragments of others, the stomach being about half filled with the remains of this insect.

1 beetle resembling a small *Harpalus*.

2 small grey weevils and a number of fragments of another Rhyncophorus beetle of a dark-brown colour.

1 spider.

1 Texas-fever tick (*M. annulatus australis*), a partly engorged female.

The finding of ticks is of economic importance; while the discovery of the green "stink-bug" (*Loxa flavicollis*) is of great bionomic interest. This bug, whose odour is horribly offensive, does not possess any warning coloration; but, being of a uniformly green colour, is highly protected and difficult to discover when resting among the leafy branches of a tree or shrub. It is common, but not apparently abundant, though it is not infrequently attracted at night by artificial light. The amount of odoriferous matter contained in the stomachs of the birds found to

contain the remains of this bug was so offensive as to render the operation of dissection positively unbearable, and the fœtid odour was with difficulty removed from the hands of the operator.

Another record of interest in reference to the food of this bird was made one day in the month of January, while watching the habits of a pair bringing food to a fully-fledged young one, which had perched itself in a very convenient place for observation, quite close to where the writer was seated. At first one of the old birds was seen to advance with a huge mouthful of something, appearing most like a bundle of dark-coloured feathers, which it was seen to procure from the foot of a tree not far away. This object was offered to the young bird and accepted by it immediately; and while it was making a strenuous effort to swallow the dry-looking morsel a couple of missiles thrown into the tree made it relinquish its hold of the object, which, when secured, proved to be the somewhat mangled remains of one of the huge black "Witch Moths" (*Erebus argarista*), measuring originally nearly six inches across the wing.

Scale Insects Infesting Rubber.

Broadly speaking, the rubber-producing plants are particularly immune from the attacks of insects. In Jamaica two species of scale insects * were found infesting rubber plants, but only one can at present be considered harmful. The round purple scale (*Aspidiotus ficus*) was found in small colonies on the leaves of Para rubber (*Hevea brasiliensis*) in the Chapelton district, but not in sufficient numbers to cause any injury to the plants. This insect is, however, a great pest in many parts of the world, so that its presence should be looked upon with suspicion, and if found to increase in numbers should be checked before it gets headway and thus becomes a menace to such an important article of commerce.

The Central American rubber (*Castilloa elastica*) in certain portions of the island is, however, very severely attacked by a common white Diaspid scale (fig. 39) (*Diaspis amygdali*), and so serious was the infestation in the Chapelton district that measures were taken to check its ravages. The young trees which were examined by the writer had attained a height of some ten feet or more, and the long, slender stems of a large percentage of these were found to be covered with the scales, and in those colonies which had become overcrowded the insect had migrated to the leaves, on which they had fixed themselves chiefly, or almost exclusively, along the ribs of the great leafy fronds, forming distinct white lines which were quite conspicuous even at so great a distance from the ground.

At first it was difficult to account for the presence of this insect, and it was assumed that possibly it was present upon the young plants when imported from the nurseries. But on carefully examining other

* Mr. Maxwell Lefroy records (*Imp. Dept. Agric. Bull.*, vol. iii. 1902) the occurrence of *Aspidiotus articulatus*, *A. cydoniae* and *Asterolecanium pustulans* on *Castilloa* at St. Kitts.

trees in the cacao plantation it was subsequently found that the great boles of the Immortelle trees (*Erythrina umbrosa*), whose glorious flowers formed a beautiful feature in the landscape at the time of my visit, were badly infested with the same kind of scale as that which was attacking the Castilloa. The inference to be drawn from this was, therefore, that the insect in question had migrated from the Immortelle to the Castilloa, though it is important to note that the trees in question were generally growing very widely apart, and it is difficult to explain how the young lice (larvæ) of this Coccid could have travelled so far and have sought out practically every rubber tree in the plantation. Some of the young scale may have been wind-borne, and others may have been carried by other agencies, such as birds, insects, or even man; but it is impossible that the infestation could have become so general by such foreign agencies as I have indicated.

The owner had already taken practical measures to check the spread of this pest. All the infested trees on his estate had been treated with a coating of lime and salt in the following proportions:—

Air-slaked lime	Two parts
Salt	One part

with water added to make it into the consistency of cream. This mixture was applied to the tree trunks so as to completely cover them. The result proved highly satisfactory. An examination of the scale which remained upon the trees showed that a very large percentage of the insects had been killed. It was only in those places where the lime had peeled off that living insects were found. It is evident, therefore, that in such cases a second application is necessary. It is important to note also that the trees thus treated had not apparently suffered any ill-effects from the wash, so that its use may be recommended with safety. It is doubtful, however, if such a wash will prove equally effective on other trees, as it must be borne in mind that the young Castilloa trees are covered with hairs to which the lime readily and more or less permanently adheres, so that it covers the scale insects, at any rate for a sufficiently long period to prevent the young escaping from beneath the shield-like covering or from the eggs which may not be destroyed by the application. It is obviously necessary also that the boles of the Immortelles should also be treated with some kind of wash, and for these trees the writer would recommend the lime and sulphur wash, which for smooth-barked trees is much more effectual than the lime and salt, though two sprayings or dressings may be found necessary.

As a means of prevention, seedling plants should be very carefully examined for such pests, and if found to harbour them should be discarded altogether or subjected to treatment with hydrocyanic acid gas before they are removed from the nurseries. The safest course, as well as the most economical one, is to refuse absolutely to accept nursery stock unless it is perfectly clean and free from such pests.

INTENSIVE CULTIVATION IN MADEIRA.

By Miss Eleonora Armitage.

[Read January 25, 1910.]

The following account of some simple facts about agriculture and economic horticulture in Madeira is drawn from my own observations during the months of January, February, and the first half of March, 1909. These notes I have named "Intensive Cultivation," though that is no doubt a term unknown to the industrious Madeira peasantry, who follow their daily occupation, week in, week out, of unremitting labour in the ceaseless cycle of growth. They have the great wonder of the continuity of life ever before their eyes; and no rest do they get, nor does their land get any, in this island with its mild, equable climate, where irrigation supplies water at all times, even in summer droughts, when Nature tells the living things to rest and æstivate.

Madeira is one of the Atlantic islands belonging to Portugal, lying 320 miles off the coast of Africa; Funchal, on the south, being situated in lat. 32° 37′ N. and long. 17° W. It is only about thirty miles long by twelve broad, but is a very steep-sided volcanic island, some of the mountain-tops reaching 5000 to 6000 feet. The mountain sides are seamed with many deep ravines, and all cultivation has to be carried out on narrow terraces raised by hard labour; these are supported by rough walls from four to ten feet in height. The soil, when cleared of loose stones, is a fertile volcanic earth, in some places of a brilliant red colour. The mean annual rainfall of Madeira is about thirty inches, most of which falls in the winter months; snow lies on and off for a couple of months on the highest mountain tops. The mean winter temperature is 60° F., with a daily variation of about 10°. The winter minimum falls on but few days below 48°, nor does the maximum often rise above 65°, so that vegetable life goes on freely throughout the winter, aided in the drier times by irrigation.

Irrigation is one of the wonders of the island. One looks with admiration at the miles and miles of "*Levadas*," or aqueducts, stone and cement watercourses which girdle the land at varying heights: one is more than seventy miles long; some are tunnelled through the rock; all take their origin from the springs on the highest mountain tops. The *Levadas* were made by vast toil of men, and are kept in order by Government officials with ceaseless scrutiny and much labour of repair.

With these general conditions in view, we may now deal in detail with the cultivation of the crops.

FIG. 41.—SÃO MARTINHO CHURCH WITH THE ADJOINING GRAVEYARD THICKLY PLANTED WITH CYPRESSES.
The hill to the right is Pico do São Martinho, that to the left is Pico dos Bacellos. The central mountain mass is seen in the background.

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FIG. 42.—A CASCADE IN THE RAVINE OF THE RIBEIRA DA SANTA LUZIA. The stream joins the river among the pines below.

FIG. 43.—A ROAD AMONG THE HILLS TOWARDS THE CURRAL DAS FREITAS, SHOWING BRIDGES AND THE USEFUL REDE OR HAMMOCK BORNE BY THREE MEN.

Terrace cultivation is carried out wherever possible.

Fig. 44.—Hillside above Camara de Lobos, near Cabo Girão.
Showing terrace cultivation on steep hillsides where choice vines are grown.

Fig. 45.– The Gorge of the Ribeira da Santa Luzia from the Pico das Rosas.
Pines are planted on the higher slopes, and here and there below terrace cultivation is seen.

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Gourds: "Abobora."

Gourds are grown everywhere; they form a staple food of the peasantry, being the foundation, with sweet potatos and colocasia, of their vegetable soups or *sopas*. Every workman, be he roadman, woodman, or gardener, goes out to his work provided with a neat covered basket containing his dinner; out of the basket proceeds a bowl filled with a thick, wholesome mixture of vegetables, all boiled down together; some bread; fish, fresh or salt; and he is generally able to add to his *menu* oranges and bananas for dessert, and, during the cane season, a stick of sugar cane to chew. The gourds are chiefly of three sorts, *Abobora preta* (*Cucurbita moschata*), large globose dark green ribbed fruits with red flesh; *Abobora de machado*, enormously heavy, oblong, greyish-green fruits, mellowing to yellow, 12 to 18 inches long, with pale flesh; and *Boganga branca* (*Cucurbita melanosperma*), smooth and oval, with greenish-white speckled rind and white flesh. A large vintage-basket full of these is a tremendous weight, yet a man will carry it on his head for several miles down the mountains. The green wrinkled *Pepinella* (*Sechium edule*) is a small kind of gourd of delicate flavour. These gourds are grown on the ground on terraces, often in large patches, trailing into one another, the weeds coming up through them. As the fruits ripen they are cut and eaten; some are put on each cottage roof to mature for seed and for keeping. Gourds are also planted singly here and there on any spare ground with a few rods stuck in for them to climb up, or among the bare vine stems up which they are trained and run along the *latadas*, the fruits hanging down along the branches, as they trail to a considerable length. When the plants are exhausted they are all pulled up and the ground cleaned and made ready for some other crop. Cucumbers, "*Pepina*," and the melon, "*Melaõ*," are grown later in the year.

Colocasia: "Inhame."

A large edible rhizome, slimy and succulent, of a greyish colour, is produced by *Colocasia antiquorum*, the "*Inhame*." It is a handsome crop when growing; tiers of terraces are covered with closely planted rows of it; the stout leafstalk is over two feet in length, and bears a great heart-shaped leaf balanced on the top so that the leaves all face towards the prevailing sunshine, rather east of south on an easterly-facing terrace; they form a complete leaf-mosaic, dovetailing one into another in the neatest manner, presenting an almost unbroken leaf expanse to the sun and air. The work of this large assimilating surface results in the building up of the tuberous root-stock. When these are full grown they are taken up, the yellowing leaves cut off, the ground deeply worked with the "*enxada*" (fig. 46) and manured, and pieces of the growing head of the tuber with the old leaf-stalk attached are planted again in rows, filling up the terraces at once.

Potatos, &c.

Potatos (*Solanum tuberosum*), "*Semilhas*," are usually planted by themselves, in trenches well-hoed and manured; in some instances I saw small quantities of artificial manure being carefully placed between the seed potatos in the rows before they were covered up. Broad beans are sometimes sown between the rows of potatos.

Sweet potatos (*Ipomœa Batatas*), "*Batatas*," are planted in wide trenches, and, with a double row of cabbages on the ridge, form a close carpet of vegetation. Often in these trenches (which are in universal use for vegetables for the purposes of irrigation) four crops are growing at the same time: (1) young sugar cane from cuttings, which will not become marketable canes till the next year; (2) sweet potatos; (3) cabbages or cauliflowers; (4) broad beans. The last-named crop comes off first, either as green forage or a market vegetable; then the cabbage or cauliflower, and lastly the sweet potatos, leaving the sugar cane in possession.

Broad beans (*Faba vulgaris*), "*Favas*," are frequently grown as a terrace crop by themselves, and delicious whiffs of their blossoms' scent are blown to meet one, while bumble-bees are busy sipping the nectar.

Green peas (*Pisum sativum*), "*Ervilhas verdes*," are an excellent and prolific crop. The top shoots of *Arundo Donax*, bamboos, and willows are used as peasticks, even sometimes the ends of pine boughs. The French bean (*Phaseolus vulgaris*), "*Feijão*," naturally luxuriates in a climate like that of Madeira, and is of excellent flavour; it is dressed either whole or sliced. The plant is easily grown and climbs up trellises and reeds, put up in any spare corner. A number of beans and peas are grown and harvested when ripe, and the dried seeds are used in the "*sopas*" and as vegetables.

Such are:—

Dried Peas	...	. .	...	"*Ervilhas seccas.*"
White Bean	...	...	...	"*Feijão branco.*"
Haricot Bean	...	...	...	"*Feijão carrapato.*"
Butter Bean	...	...	...	"*Feijão manteiga.*"
Cicer Pea ...	...	...	...	"*Grão de bico.*"
Lentil ...	...	...	...	"*Lentilha.*"

Tomatos (*Lycopersicum vulgare*), "*Tomate*," and eggplants (*Solanum Melongena*), "*Pere melange*," are placed against sunny banks or odd corners. Lupins (*Lupinus Termis*) form an exceedingly pretty crop with their pale blue, or grey and white, flowers and elegant palmate leaves. This is a highly esteemed forage plant.

Seed Beds, &c.

The peasants keep seeds of their vegetables for sowing the next year; thus one sees tall yellow flowering plants of cabbages (*Couve*) and cauliflowers (*Couve flór*) adorning each man's garden patch, a plant being left here and there to seed where most out of the way of other

ps. The seed-beds are carefully tended and the tiny plants well ered and weeded; one sees little square patches of seedlings sown adcast, onions (*Cebolas*), cabbages, and cauliflowers, and young nsplanted seedlings in all stages of growth.

Other crops grown are turnips (*Nabos*), carrots (*Cenouras*), beetroot *terruba*), spinach (*Espinafres*); a coarse kind of latter growing ended on walls and waste patches of the gardens. On terraces in ravines, in the shadier places, the various salad plants are grown constant succession and kept very freely irrigated. Immense ntities of lettuces (*Alfacas*) are thickly planted and are of all ages l size, from the seed-beds and tiny pricked-out seedlings to the rketable lettuce generally of the Cos form. Radishes (*Rabanos*) grown in the same way, a large, round, red variety. Watercress *greão*) is in great demand and is cultivated; it also grows wild by *levadas* and streams in the mountains.

Succession.

Observing some of the terraces at various elevations about nchal at the end of February, the following quick succession of ps was noticeable:—

Potatos.—First, seed potatos being planted.

Second, the potatos growing, in various stages.

Third, the ripe tubers being dug.

Sweet Potatos.—First, the stem-cuttings being put into trenches, ll watered, with bottom-heat obtained by burying chopped-up getation; after a few days of looking wilted in the sun, they quickly k up and grow along.

Second, a thick growth with cabbages between.

Third, the mature tubers dug for market.

Colocasia.—First, being dug.

Second, the pieces of rhizome being replanted.

Cabbages.—First, in full crop.

Second, flowering for seed.

Third, in the seedbed.

Fourth, transplanted and growing in all stages.

Bananas are in bearing all the year. The fruiting stems are cut wn and successive shoots arise from the stool, grow, and bear fruit due course. When March comes in the first green leaves begin show on the vines on the lower slopes, and all crops must be eared away from them; but on the higher terraces the peasants are ill busy pruning with *sécateurs*, and tying in the shoots to the *latadas* rellises), and repairing and renewing the latter.

The vine (*Vinha*) is the most important product of Madeira, but I o not further allude to it, as I was not present at the vintage.

Ravine (*Ribeira*) Culture.

Even the precipitously steep, shady ravine banks are cultivated. Here the Giant Reed (*Arundo Donax*), "*Canna*," luxuriates. It is

much more grown and used in the island than is the bamboo. The slender, strong canes grow from 12 to 15 feet high, and are 1 to 1½ inch in diameter. They are invaluable for the lighter trellis-work, the cross-work on the vine *latadas*, and on the garden *corredors* which are covered with climbing plants. The leaves are useful for litter, but are probably too siliceous for fodder; for the latter purpose banana and sugar-cane foliage are used.

Bananas (*Musa sapientum*), "*Bananas*," flourish amazingly in the ravines, growing to a lordly height, and sugar cane is planted there too, while near the bottom of the ravine, on any sufficiently flat piece of ground, the Colocasia adds its fine giant leaf to the varied foliage effect, scarlet nasturtiums (*Tropæolum majus*) ramping over all.

Wheat Culture.

In mid-February the wheat plant, "*Trigo*," was conspicuous on the terraces, sometimes planted by itself in thick rows, or, again, sown broadcast among cabbages of various ages. It is often pulled up for forage when a foot or more high, and thus cleared out of the way of the new crop—a novel kind of catch-crop. The yield of grain on that which is allowed to grow up and ripen is poor, but the straw, which is pulled up by the roots, is used, just in that state, for thatching the huts.

Sugar Cane.

Sugar cane (*Saccharum officinarum*), "*Canna d'Assucar*," is largely cultivated in the island, and can be grown from sea-level to 2,000 feet. The largest patches and terraces are devoted to this crop, and also the tiniest level spots hard won from the steepest hill-slopes will be planted with it. The bright yellow-green of the sugar cane foliage forms the most conspicuous colouring of the hillsides around Funchal Bay and along the coast south-westwards. Sugar cane patches are very commonly bordered by a vine-*latada*, under which the cane can be grown, as the crop is cut from the beginning of March, and therefore cleared off before the vine foliage is put forth. Sugar cane grows from 7 to 8 feet high; the lower leaves are first trimmed off with curved knives (*pudãos*) (fig. 46), and neatly tied up into bundles to carry into the town, where they are used as fodder for the oxen and milch cows in the stables. Then the serious cutting down of the cane follows; the remaining leaves are trimmed off and the canes loaded up on ox-sleds, to be taken to the sugar factory. The narrow streets get quite congested with cane traffic, and the men and boys shout ceaselessly to their strong, patient beasts, "*Ca, Ca, mim boi!*" (Come here, my oxen!). In making a new cane plantation, other crops can be grown in between the rows, while the cuttings are young and slender, and the patch will remain in good bearing for several years.

Fruits.

Besides bananas, already mentioned, several other fruits are grown in Madeira. Oranges (*Laranjas*), mandarins (*Laranjas mandarinas*),

and lemons (*Limães*) are grown commonly in gardens up to 1,800 feet, but the oranges are very small and inferior, evidently the same kind that was first introduced to the island, no effort having been made to import better varieties, probably owing to great destruction by scale insects. A delicious and very abundant winter fruit, lasting in season from January to April, is the custard apple (*Anona cherimolia*, "*Anona*"); Guavas (*Psidium Guava*, "*Goiaves*") and Loquats (*Eriobotrya japonica*) are spring fruits, and so are the Passion fruits

FIG. 46.—TOOLS USED BY THE MADEIRA PEASANTS.
The two pudàos or pruning knives cost 6*d*. each, the enxada 2*s*.
(Half size.)

(*Passiflora edulis*; "*Maracujas*"); these are all commonly grown about Funchal. Less grown and more expensive are strawberries ("*Morangos*"), ripe in March, and pineapples ("*Ananas*"), grown under glass without heat. Peach and almond (*Amêndoa*) trees are common at a low elevation. Apples ("*Maçãs*") and pears ("*Pêres*") are not much grown, and do not produce fine fruit. Fig trees ("*Figueira*") are frequent. I have constructed a table of prices of fruits and vegetables obtaining in the markets and shops in Funchal, which is appended to this paper. There is, no doubt, a considerable fluctuation according to the season.

Mountain-side Cultivation.

On the south side of the island much of the primeval woodland has disappeared. "*Madeira*," which means "wood," was the name given to the island by the Portuguese discoverers, on account of its densely forested appearance. The ancient chestnut and laurel woods are cut down and some oak and plane planted, but the greatest woodland industry is the pine cultivation. The quick-growing Maritime Pine (*Pinus Pinaster*), "*Pinheiro*," is planted in thousands on the steepest mountain sides wherever a thin layer of soil covers the rock, from 1,500 feet to the pine tree limit, which is reached at about 4,000 feet. Here the pines may be seen in patches of varying dimensions and of all ages and sizes, from seedlings and those whose twigs have passed "The kids' lips, the stags' antlers"; from slender saplings up to the lofty slim trunks which are felled and cut up into cord-wood on the hillsides and dragged down to the town by men and oxen in huge piled-up loads on sleds, to supply firewood for Funchal and all the other inhabited places. Smaller trees, 15 to 20 feet high, are used to form the strong uprights for *corredors* and *latadas*, to be covered with an interlacing roof-work of giant reeds. The pine-cones are used as kindling for the wood fires. When the pine-seeds are sown broadcast on the roughly hoed-up mountain-sides other seeds are scattered with them, notably the Broom (*Sarothamnus scoparius*), "*Giesta*," which, growing up, protects the pine seedlings and is cleared off after three or four years. Much use is made of the Broom; the finest basket-work is made of Broom twigs, while the green branches are cut and placed at the bottom of the trenches in the vegetable gardens before the crops are sown or planted in them. Besides rotting down and forming a useful fertilizer, during the process they evolve a pleasant warmth, which, as bottom heat, hastens the growth of the crops.

Willows.

One of the great industries of Madeira is the basket-work. One passes strings of women walking down from their mountain villages 1,000 to 3,000 feet up, carrying a pile of four to six wicker chairs on their heads, and boys with sticks over their shoulders, from which hang numbers of baskets. They make settees, chairs, footstools, tea-tables, work-tables, baskets of all shapes and sizes, covered and otherwise. The willows used in this work are grown up in the mountain ravines and on the edges of the terraces, mostly between 1,000 and 2,000 feet. The willow trees are very cleverly planted so as not to shade or injure any crop; they are put in any odd corners where they can have a modicum of soil and plenty of water, and especially are they planted on the outer edges of the high terraces, which are often 8 to 10 feet one above another, so that the bushes hang over and outward with plenty of room.

Tools.

The tools (fig. 46) with which all this hand-cultivation is accomplished are few and simple. The most important one is the *enxadà* (pronounced "ensharder"), which in slightly differing forms is used for grubbing up trees and bushes and removing stones on the mountain sides, or for picking up the roads prior to laying down the hard granite paving-cobbles; or the form figured, the usual garden form, the heavy, long, narrow wedged-shaped hoe with which the straightest trenches for crops are drawn out, and the thick tangle of weeds, which have always accumulated during the growth and harvesting of a crop, is torn and dragged up by the roots: indeed, a spade is but rarely used. I have found this tool of great utility in my own garden. For small weeding work and all cutting off of herbarge a very small billhook is used, or a much curved knife, a *pudâo*; with this the maize and sugar cane leaves are stripped off, and I find it of constant use in the herbaceous border. For pruning purposes sécateurs are in universal use.

Table of Prices (Approximate).

Vegetables.	Hortaliças.	Price. (Kilogrammes converted to lbs. avoirdupois and reis to pence.)
Potatos	Semilhas large	2½*d.* lb.
	Semilhas small	2*d.* „
Sweet potatos	Batatas	1½*d.* „
Colocasia	Inhame	1*d.* „
Gourds	Abobora preta	1*d.*—2*d.* each
	Abobora de machado	6*d.* „
	Boganga branca	2*d.*—4*d.* „
Chuchu	Pepinella	1*d.* „
Cabbage	Couve	2*d.* „
Cauliflower	Couve flôr	6*d.* „
French beans	Feijão	6*d.* per lb.
Broad beans	Favas	1½*d.* „
Green peas	Ervilhas verdes	3*d.* „
Onions	Cebolas	2*d.* „
Turnips	Nabos	3*d.* ½ doz.
Carrots	Cenouras	2*d.* lb.
Beetroot	Beterrubas	6*d.* lb.
Radishes	Rabanos	3*d.* a bunch
Tomatos	Tomate	1½*d.* lb.
Eggplants	Pere melange	2*d.* each
Spinach	Espinafres	1*d.* lb.
Lettuces	Alfacas	1*d.* each
Dried peas	Ervilhas seccas	2½*d.* lb.
White beans	Feijão branco	3*d.* „
Haricot „	„ carrapato	3*d.* „
Butter „	„ manteiga	2½*d.* „
Cicer pea	Grão de bico	3*d.* „
Lentils	Lentilhas	2½*d.* „
Sugar cane	Canna d'Assucar	3*d.* per stick

Fruits.

Oranges	Laranjas	6*d.* doz.
Mandarins	,, mandarinas	9*d.* ,,
Lemons	Limões	7*d.* ,,
Passion fruits	Maracujas	1½*d.* each
Custard apples	Anonas small	1*d.* ,,
	Anonas medium	2*d.* ,,
	Anonas large	6*d.* ,,
Guavas	Goiaves	5*d.* doz.
Loquats	Loquats	4*d.* ,,
Strawberries	Morangos	10*d.*—1*s.* lb.
Pineapples	Ananas	10*d.* doz.
Apples	Maçãs	6*d.* ,,
Pears	Pêres	4*d.* ,,
Bananas	Bananas	½*d.* each

The illustrations accompanying this paper are from photographs by Miss K. M. Crosse, F.R.H.S., of Caterham Valley, Surrey.

FIG. 47.—A STREET IN FUNCHAL WITH COBBLE PAVING, LOOKING UP THE GORGE OF THE RIBEIRA DE JOÃO GOMES TO THE HIGH CULTIVATION IN THE CURRAL DOS ROMEIROS, 2,000 FT. ABOVE.

Below are bananas and sugar cane.

FIG. 48.—HILLS NEAR SANTONIO WITH A BRIDGE OVER THE RIBEIRO SECCO.

Sugar cane, willows and vines below, with cultivation terraces up to the pines. The round trees in the gardens are oranges, lemons, guavas, custard apples, loquats and other fruits.

(*To face page* 72.)

PLANT HYGIENE.

By F. J. Baker, A.R.C.S., F.R.H.S.

[Read March 8, 1910.]

The dread of plant diseases and pests is ever with us. If at the moment free from actual attack, the warnings of investigators and the advertisements of insecticides, &c., remind us of the existence of innumerable minute foes that are stated to be ready to destroy our treasures. The Conference on Spraying, held in October 1908, gave an indication of what diversity of opinion there is concerning plant diseases and the utility of the common methods of dealing with them. We are continually being asked what should be done for this or that trouble; and although quite easy to specify what is, for the time being, considered the orthodox remedy, one has the feeling that more real service could be given if it were possible to investigate the predisposing causes. If the exciting cause were removed, the effect would tend to disappear. Generally, though not always, a specific fungus or insect pest is present, but a thorough search will often reveal a general unthriftiness, mistaken probably, in many instances, by the untrained observer for unusually vigorous growth. Something may be learned by going into glasshouse, garden, plantation, and field and searching for plants apparently less thrifty than the majority, and comparing as minutely as possible their surroundings with those of the more healthy-looking.

The important question to my mind is: What are the predisposing causes of disease? Why is this plant the first or most badly attacked, or why is the disease more virulent in it? Very frequently, if seen soon enough, there is no specific pest present, although usually an attack is not long delayed. The endeavour to destroy pests by spraying often results in ill-effects upon the plant, and not infrequently some other trouble ensues.

The chief causes of unthriftiness in plants are: Heredity, or inherited weakness; structural imperfections; adverse physical conditions of climate, temperature, water, and soil; and last, but not least, malnutrition. A plant of weak hereditary constitution may, under the most favourable conditions of food, soil, and climate, develop into a mature and useful plant. On the other hand, a plant of strong constitution may be rendered useless by adverse conditions. It is very bad policy for a cultivator not to take care to secure stock of the most vigorous constitution, but it is worse to ruin that stock by improper management.

There appears to be very little doubt that in the near future scientific research will do much towards breeding plants of strong constitution

and immune to specific disease. There have been various claims in this direction, and apparently in the U.S.A. several successes. There was a hope that *Eriophyes ribis* (the black-currant mite) would be conquered in this way, but fruit-growers are still waiting an immune variety. It has been claimed that certain potatos are very resistant to *Phytophthora infestans*. Unfortunately, experience has taught me that some of those varieties which have been said to be the most resistant have been the first to succumb under certain conditions of soil and climate.

Twelve years ago I gathered some wild parsnip-seed; the plants grown therefrom have since been regularly selected and cultivated in their natural habitat, but under garden conditions, the object being to get a hollow-crown variety, immune to rust. Two years ago I had succeeded in getting a good-shaped plant, although not so large as usually demanded, of excellent flavour and resistant to rust. The next season a still further improvement in size and flavour was reached, but, alas! rust appeared. Last season's results were very disappointing. I hear, however, from some to whom I gave seed last season, that their results were satisfactory, or largely so. Does this mean that the change of soil and climate invigorated to the extent of making resistant? It may be so. In this connection it may be mentioned that fruit-trees are often attacked badly by fungi on some soils, but are practically immune from their attack on others. Thus, King of the Pippins, Ribston Pippin, Cox's Orange, and several others are attacked badly with canker on the formations of the Thanet sand. Even the common crab-apple is so badly attacked that the cankered stems are sometimes used for ornamental cabinet-work. A few miles away, where the soil is very shallow and rests directly upon the chalk, notwithstanding hundreds of acres of apples, including those mentioned, are grown, a cankered tree is rarely seen. Cox's Orange, and especially Peasgood's Nonesuch, do extremely well at Swanley, but a few miles nearer Rochester not nearly so well. Farmers know that a judicious rotation is no small means of keeping plants healthy. The difficulty which gardeners have of thoroughly purifying the glasshouse soil is well known to be one about which they would heartily welcome sound advice, and it is to be hoped that experimental work now in progress will be productive of satisfactory results.

Is it that some soils are so completely adapted to particular plants that they invigorate to the extent of making disease resistant, or is it that a something is absorbed by or formed in the plant which is toxic to the pest? In 1908 I had a heap of London manure adjoining a potato field. On that heap came up several self-sown potatos and tomatos. The potatos in the field were badly infected by Phytophthora; those on the manure heap remained vigorous a much longer time, and the tomatos also went on fruiting. This is precisely the reverse of what was expected. Was it something taken from the manure that protected them from attack? Considered in conjunction with other experiences, I rather believe so. It is such problems that one would

like to investigate, but where private resources fail. There is considerable evidence that plants occasionally do absorb some substance which appears to be toxic to certain diseases. Cultivators, however, should wait for unimpeachable evidence that any substance recommended for this purpose really is of use and that the utility is not counterbalanced by injurious qualities, before investing too heavily. Try samples by all means, but see to it that the plants, soil, and other conditions are really representative and make exact comparisons.

My purpose now is rather to induce cultivators to adopt every possible method of making plants self-resistant by hygienic means. The soil and climate have more to do with immunity from disease than one often recognizes. The fact that one first-rate investigator is very emphatic in his statements and advice, and another equally recognized authority says the results of his contemporary worker require confirmation by independent scientists indicates a chaotic state. The unfortunate result is that the most fluent speaker, if he has an attractive, magnetic influence, will obtain the greatest following, quite independent of the soundness of his advice or otherwise.

When carnations or chrysanthemums have been propagated by amateurs, one frequently finds a plant looking very unhealthy, and often dying altogether, owing to structural imperfections, near the base. This is because, when propagating, a flowering shcot had been included among those selected. Such shoots fail to produce vigorous plants, and the failure is usually just before flowering, owing to the severe strain then put upon the conducting and supporting tissues. The remedy is obvious.

An imperfect union of bud or graft on a stock not infrequently causes trouble when full fruition is expected. Even the most perfect union of a scion on a stock gives a very different connection from the natural one, and it is certainly not sufficient that the scion just "takes." Structural imperfections may be due to injury caused by disease or a wound. Removing a narrow ring of tissue, extending to the cambium, from fruit trees is an intentional wound causing an imperfection which will arrest vegetative growth and induce the tree to flower and fruit abundantly for a short time, but is often followed by a dying state. This is only justifiable when old trees are to be destroyed within a year or two. The first apparent effects are much the same as, but more decisive than, root pruning; but whereas root pruning, judiciously done, results in considerable permanent improvement, ringing frequently has disastrous ultimate effects. Knowledge is power, and it is well to record the fact that one has known an unfruitful old plantation worked up and offered for sale in an apparently greatly improved state. The chief operation was ringing of the trees just under the surface soil. Our laws are framed on the principle that the buyer must beware, but such a practice is a moral, if not a legal, fraud.

Adverse climatic conditions often make it almost impossible to grow certain plants in a particular district or aspect, and this fact is so obvious that it is needless to enlarge upon it. An occasional prime

cause of trouble in a glasshouse is a faulty structure, which allows a draught of cold air towards the heating apparatus. This draught induces a local chilling on parts of plants, and non-resistance results. The chilling blast often contains some spore which will set up disease on, or in, the non-resistant part. From that point the disease spreads.

A study of garden literature of over one hundred years ago suggests that cultivators were less troubled with plant diseases than now—their plants were hardier, no doubt because they did not force so much. Cheap glass and chemical fertilizers have resulted in loss of stamina. Lack of balance between light and heat is responsible for much. For instance, it is comparatively easy to grow French beans for winter use, but there are many failures, and one of the commonest causes is that the grower does not appear to realize that he must regulate the heat, which he has practically at his command, with the light, which is a very variable quantity, especially from October to January, the most critical months. When the light obtainable is deficient, the heat must also be somewhat reduced, or weakly growth and fruitlessness will result. Neglect of this extremely important point is the cause of much trouble, especially when the autumn and winter is unusually sunless. The market gardener too often endeavours to raise such seedlings as Brussels sprouts under glass, and consequently gets weakly plants.

Judicious watering is immensely important, and, fortunately, practical men know their work well in this connection. Using water several degrees lower in temperature than the plants upon which it is placed should be avoided.

A suitable physical condition of the soil for the plant grown is another subject too large to be adequately dealt with here. Expert gardeners know the importance of having a firm soil for strawberries, raspberries, carnations, onions, &c. In order to secure hardy, vigorous broccoli which will be ready for use in, say, February, it is necessary to have the soil very firm, notwithstanding that Brassicas generally like a well-tilled and aërated soil. An undesirable physical and chemical state of soil is occasionally caused by applying an acid fertilizer, like superphosphate, to a soil deficient in lime. This is generally recognized, but my experience is that the soil is frequently rendered acid or otherwise unsuitable by the common method of putting dung down, say, two spits deep, and especially so when it is put at the bottom of the spit. Can we picture the root of a plant ramifying through soil containing little organic matter, encountering what must appear to it to be an almost impassable stratum of dung rich in the products of anaërobic decomposition? Cultivators should try whether such plants as sweet peas do better with a layer of rank dung at a foot or two beneath the surface, or when the manure has become thoroughly incorporated with the soil. I believe gardeners fifty years hence will wonder why this common custom was practised so long.

Without doubt the commonest predisposing cause to disease is unbalanced plant-food. Our predecessors mixed their potting-earth

from maiden-loam and leaf-mould, incorporated stable-manure and ashes, but used very little else. They dunged, limed, and dug their gardens, and grew hardy plants. To-day we have innumerable fertilizers of a highly forcing character. Rightly used they are gigantic forces in the hands of the cultivator, but what knowledge and experience are required! Consider the case of a cabbage or lettuce planted in autumn to stand the winter. If it be planted in too rich soil, it will make succulent growth and fall an easy prey to frost. But if grown in a soil not too rich, but very firm, it will stand the many different samples of weather so characteristic of our English climate. Then, when milder weather comes, or a short time before it is wanted, a small quantity of nitrate may be given, and possibly a stirring of soil.

The liability of plants fed too highly with available nitrogen to frost injury was shown in the winter 1908-9. I had about 450 yards of sprouting broccoli; three rows were manured the whole length with ammonium sulphate at the rate of one hundredweight to the acre; the adjoining plot was treated in every way similarly, except that the ammonium sulphate was omitted. The frost destroyed practically every plant in the manured strip, but did no harm on the adjoining plot. A raspberry plot near by gave similar results; the thick succulent stems were destroyed, but those which had not received the extra nitrogen remained quite uninjured. This season I have grown a long strip of thousand-head kale (the hardiest cultivated Brassica), and by its side a strip of sprouting broccoli. Ammonium sulphate was applied to the kale at the rate of two hundredweights to the acre, and the result is now shown by much damage from frost; the sprouting broccoli remains uninjured. Gooseberry bushes properly summer-pruned and suitably manured with mineral-manures, but limited nitrogen, have well-ripened wood, and have resisted mildews quite effectively, whereas an application of nitrate ensured trouble of some kind.

An excess of potash fertilizer may do little or no harm. The ill-effects occasionally seen after adding phosphatic manures is due to the accompanying substances, such as unneutralized acid. An excess of lime may put such calcifuge plants as rhododendrons, lupines, and sorrels decidedly at a disadvantage, but otherwise the ill effects are usually *nil*, and much more frequently great benefit follows from application of lime than the reverse. A marked deficiency of available nitrogen will almost arrest the growth of such plants as Brassicas. An excess of nitrogen will force vegetative growth to an enormous extent, resulting in elongated, thickened, succulent stems and leaves, and such plants will fall an easy prey to frost or pest. It has been well said "All other things being equal, he will be the most successful cultivator who always has sufficient available nitrogen for his plants and none to spare." Nitrogen, as is well known, exists in the free state in inexhaustible supplies in the air; but this is useless for plants except indirectly by the aid of microscopic life, or when brought into a combined form by chemical means.

The peculiarity of leguminous plants, although commented upon two thousand years ago by the elder Pliny, only came to be fully recognized about 1886 as being due to an indirect supply of combined nitrogen. This property is destined to greatly modify our methods of treating poor soils, especially those of a calcareous character, though it is seldom necessary in ordinary farm practice to artificially inoculate either soil or seed in the way so often suggested lately. It is worth noting that although large quantities of combined nitrogen are thus formed and placed at the disposal of adjacent plants or succeeding ones, I have never during seventeen years' experimental work found any ill results, but immense good. The amount of combined nitrogen formed in this way never seems to be excessive for other plants. This property of leguminous plants is of an immense value when bringing neglected, poor land into cultivation, but I do not think it will have great value in gardens when once they are in good "heart" (*i.e.* good manurial condition).

The forms in which nitrogen is combined with other elements and of special importance to the cultivator are the *nitrates* of potash, soda, or lime (in which state nearly the whole is absorbed by plants) and ammonium sulphate, and in guanos and organic matter generally, the latter being more or less rapidly changed to nitrates. Nitrates are very soluble, diffuse readily in moist soil, are extremely liable to loss by drainage, but act powerfully upon plant growth. Combined nitrogen, especially the available nitrate form, has up to now been the most costly of all fertilizers. This high commercial value has greatly restricted its horticultural use, not an unmitigated disadvantage, for there can be no doubt that although it would have been of much service in many cases, it would have done harm in others. Four years ago there appeared to be every prospect of an insufficient supply of available nitrogen, hence the output was very limited and the price high and rising. Ammonium sulphate, a bye-product from manufactures, especially gas-works, could not be indefinitely increased. The utility, if not the danger, of available nitrogen becoming more and more recognized, it seemed as though there would be a partial famine in this important substance, but scientific research has shown means of obtaining any quantity from the atmosphere. The cost of manufacture is the only item to consider, and already it is upon the market both as nitrate of lime and nitrolim (calcium cyanamide) at prices which have compelled holders of nitrate of soda and ammonium sulphate to considerably modify their views of value, and it is safe to predict greater reductions. Nitrate nitrogen is a gigantic force in the hands of the cultivator, but it is essential that it be used aright, otherwise it is a most dangerous substance. The lower price and the consequent extended use will often mean more weakened plants, more "new" diseases or fresh "biologic" forms of old; and more heartburnings, more worry, for the hardworking but misguided cultivator.

This question of the use of nitrate nitrogen is, I am convinced, so important that it seems desirable to state that the danger

is the greater because in our educational institutions there is a strong tendency to discontinue much of the means whereby a secure foundation of pure, although elementary, science was laid prior to teaching applied science. If our colleges are content to rest on the laurels won by a more thorough system of instruction, the day is at hand when those who go out from them will spread unsound information, and the result will be more disappointed cultivators.

I fain would believe that plant-breeding and selection will give the cultivator many stocks immune to all the more troublesome diseases, as well as more suited in other respects to the exacting wants of man. Much will be done, and doubtless worth the time spent: the successes will be boomed from the housetops, the failures will usually be heard within closed doors. To ensure sound progress the cultivator must persistently investigate for himself. There are those who advise the cultivator to leave experiments to the scientist. Without doubt many problems require such highly technical knowledge that the average gardener is quite unable to solve them, but many of the most important can be better done by the practical cultivator. Especially is this so in regard to economic culture as distinct from artistic. The experimenting worker must often be willing to sow that others may reap, but thus is the harvest won. He will need to take to heart the advice given by Polonius: "Give every man thine ear, but few thy voice; take each man's censure, but reserve thy judgment."

Several years ago, in the R.H.S. Journal and elsewhere, I urged the importance of thoroughly pruning the top of young fruit trees, &c., *before* planting. This recommendation was much ridiculed then. Now hundreds of vigorous trees give ample evidence that the advice, originated from scientific reasoning and verified by practical experiment, was sound. To-day probably but few persons will criticize the suggestion that a thoroughly well-tilled soil is by far the most important factor in the growth of leguminous plants generally and late peas especially. Late peas are very liable to mildew, which can be almost entirely remedied by a thorough preparation of the soil. In the hope that some may apply a phrase taken from an advertisement, "If you like my pickles, try my sauce," a few more suggestions on practical cultivation are now added. Already the advice has been given generally to keep fresh stable manure and the like in the first spit of soil. I may add: thoroughly aërate and get the soil into a good tilth to a considerable depth, not merely the first two or three inches, as is so often unintentionally done. A careful examination of the soil from three to fifteen inches beneath the surface where plants are doing badly frequently shows a very rough state, with large interspaces and immense clods—a state in which it is impossible for roots to ramify properly, or moisture and its dissolved substances to diffuse. "Work up to a tilth, not down to a tilth" is an excellent dictum. The manuring should be dependent upon what the soil already contains and what is wanted. To supply water to plants in the garden, I prefer subsoil irrigation when practicable, which it often is not. When surface

watering must be done, do it thoroughly, and afterwards maintain a dry soil mulch by stirring the surface.

In glasshouse cultivation take the utmost care in compounding the earth, whether for border or pots. In handbooks on the cultivation of special plants we are instructed to use so much loam, so much of this and that. How often does the cultivator consider whether the substances which he has fully answer to those which the writer had in his mind's eye? Obviously if one factor varies the whole will do so, unless in the unlikely coincidence that another exactly counterbalances it. Compound earth so as to carry the plant as long as possible in a healthy condition. When feeding is necessary, let it be in accordance with the individual plant's requirements. The ability to ascertain these requires knowledge; the operation is really easy, and can be done at much less expense than that usually incurred. Suppose you have carnations or strawberries near maturation which you are desirous of feeding. The plants are not all quite uniform; some are less thriving than others. There are reasons for these variations, and the reason is plain to those who can decipher it. Those of us who study the capabilities of soil for particular purposes know that the appearances and peculiarities of the natural growth of plants upon it supply some of the best hints available in forming an opinion. In the same way, the individual cultivator should endeavour to know exactly the normal colour of the foliage and general appearance of each variety or strain of plant, and any variation therefrom his trained eye should detect at once. By prompt attention unthriftiness in the individual may be rectified and disease stopped in its earliest stage. This, of course, requires continuous alertness, keen observation, expert knowledge, prompt action.

For feeding plants, especially those in pots approaching maturation, give first a watering with ordinary water; then, about half an hour afterwards, while the soil is still near the maximum state of wetness and therefore in such a condition that a dissolved substance will diffuse through the moistened soil (like ink on a wet surface), go round with about an ounce of saltpetre (nitrate of potash) dissolved in a gallon of water, and give a few drops to each plant, except those which have very green foliage; these should be missed. If the fructification appears to require strengthening, an equal amount of phosphate of potash—which can now be obtained cheaply—may be added; or, better, apply them separately either the same day or another, for not infrequently it will be found that some plants require one substance, but not the other. This method sounds complicated, but in practice it is simple, economical, and takes very little time. Err on the side of giving too little, rather than too much. I advise cultivators to occasionally dissolve a crystal or two of ferrous sulphate and add a few drops to sickly plants which do not respond to ordinary treatment, especially when there is a "chlorotic" appearance. This is seldom necessary, but occasionally the effect is almost magical. So are also the effects of lime-water, especially when the soil has been soured by acid substances. Try an odd plant or two first, until experience is gained.

In all probability nitrate of lime, one of the new fertilizers, will be found to be of very great value, as a source of both nitrogen and lime, for glasshouse work. Here is an example which illustrates the need for each cultivator to personally experiment.

The importance of such items as firm or loose potting, much or little water, appropriate ventilation, cannot now be dealt with. These are essentials which the ordinary practical grower knows well.

Science has clearly demonstrated, and the alert, practical cultivator has not been slow to recognize, the importance of cleanliness. Cleansing fruit trees is only second, if indeed it is not equally important, to their proper feeding. Probably cleanliness is the best safeguard against insect pests, just as, in my opinion, appropriate feeding is the best *single* safeguard against fungus attacks. However, it is not one item only which ensures success, but the combination of many. Some of the factors are at present incommensurable, some variable, and some unknown. Who, then, can mathematically calculate the resultant? Science can and will help the cultivator tremendously, and the biologist, the chemist, the physicist, and every other scientific investigator have a great work in winning from Nature her secrets, and this must often be done without any special view of the utility to which the knowledge may be put, if any. It is in the attempt to apply scientific truths to practical affairs without proper consideration of all the factors involved that so much absurd nonsense occurs. The mere theorist who turns to economic culture will soon very greatly modify his views respecting the utility of the application of his theories or he will go under. His modified views may not find favour with his colleagues, and they will demand statistical demonstration of his opinions. This may be justifiable, but it is usually too costly for the worker to get out at his own expense, more particularly when the information thus published will be to his own pecuniary disadvantage.

The day will come, I hope in the near future, when the professor of horticulture, versed in science and practice, will be qualified and able to gather up the known facts and endeavour to weld them into one harmonious whole. When on land under his own management he will act as the connecting link between science and practice, and that without prejudice, fear, or favour, in accordance with the ancient saying: "Let us have truth though the heavens fall, for assuredly if truth prevails the heavens will not fall."

THE USE OF THE SPECTROSCOPE IN THE STUDY OF PLANT LIFE.

By Rev. Prof. G. Henslow, M.A., V.M.H., F.L.S., &c.

[Read April 5, 1910.]

Experiments to test the effects of light upon the growth of plants have been frequently made from the end of the eighteenth century to the present day, and, during the last sixty years, with the addition of coloured media, to ascertain the relative effects of the different rays of the solar spectrum. The results have never been more than approximate only, as on the one hand so many different processes are going on simultaneously in the plant which interfere with any attempt to find out the actual conditions of any one of them; and secondly, the rays cannot be sufficiently isolated so as to use a pure monochromatic light. The results of experiments have therefore not altogether unexpectedly been contrary.

I propose, therefore, only to give the general conclusions arrived at and some results of my own experiments.

The three chief functions of plant life excited into action by the sun's rays are *Respiration*, or the process similar to our own breathing, involving the absorption of oxygen and the giving off of carbonic acid gas; *Transpiration*, or *Exhalation*, as it is sometimes called, the giving off of the vapour of water; and *Assimilation*, or the absorption and decomposition of carbonic acid, whereby the carbon is retained, the first visible product being starch, while the oxygen is given back to the air. All these functions are performed by living protoplasm; but with this difference, that while respiration is stimulated by heat-rays, and may go on independently of the luminous rays, as in seeds germinating in darkness; and transpiration does not cease, though it is lessened when plants are blanched in total darkness, as sea-kale; yet this function as well as assimilation is, in normally green plants, dependent upon the direct action of the solar rays, which are absorbed by the green colouring matter of the chlorophyll grains.

To render visible their absorption of light, an alcoholic or other solution of chlorophyll must be observed through a three-sided prism which decomposes white light; when the "spectrum" is thus examined with a sufficiently concentrated solution *seven* dark bands may be seen crossing it. This means that those rays of light cannot penetrate the green colouring matter, but are absorbed by it.

In a paper read before this Society on March 14, 1893, and printed in the Journal (vol. xvi., p. 89), I dealt with the effects of growing plants under glasses of different colours. The conclusion arrived at was that the yellow, blue, and colourless or clear glass were most

favourable to the process of *Assimilation*. I gave statistics of my experiments on this process of plant life only.*

On the present occasion I propose recording some experiments on *Transpiration* and comparing that with the loss of water by the purely mechanical effects of *Evaporation* by heat. *Respiration* is, as will be seen, dependent on the heat-rays rather than the luminous ones, upon which the first two mentioned are dependent.

The following, therefore, may be regarded as a contribution to the study of the relative effects of different parts of the solar spectrum on the transpiration of plants.

The conviction that light is an important factor among the causes of the phenomena of plant-growth has long been held, but it is only within the last half-century that satisfactory experiments have been made to ascertain the relative effects of different rays of light upon transpiration. Sachs, in his "Physiologie Végétale,"† says: "La lumière est un des agents qui agit le plus efficacement sur la transpiration. Mais on ne peut pas dire positivement si elle agit par elle-même, ou par son union intime avec une élévation de température."

That author repeats this opinion in his "Text-book"‡: "It is still doubtful whether light, *i.e.* radiation as such, independently of the elevation of temperature caused by it, influences transpiration." He subjoins the footnote, "Dehérain's researches§ do not decide the question."

Prof. Daubeny in 1836 carried out some experiments with coloured lights, but forbore to give any numerical results, as he met with some apparent anomalies.‖ He came, however, to the conclusion that "the processes [the exhalation of moisture from the leaves and the absorption of it by the roots] are probably dependent on the combined action of heat and light, coupled with those mechanical influences which operate upon dead as well as upon living organic matter."¶

Although the glasses used in his experiments were not tested by the spectroscope, he appears to have come to some conclusions very nearly the same as those arrived at by later observers, *e.g.* Wiesner; yet he thinks that they are exceptional instead of being the rule, as the latter believes them to be. "Now, although the experiment," he

* Since the above paper was published an interesting analogy has been shown to exist between the formation of *formaldehyde* by means of a weak electric current on carbonic acid dissolved in water, and its formation in leaves, before its change into starch. The amount varies with the light and the amount of carbonic acid present, the strength of the electric currents in green organs varying with the intensity of the light.

From Klebs' researches it would seem that red light (band No. I.?) is most concerned in the making of flowers, not the ultra-violet only, as was supposed (see *Rev. Gén. de Bot.*, vol. xxi. pp. 431, 432, and vol. xxii. p. 95ff.).

† p. 250 (1868).

‡ Second English ed. (1882), p. 678.

§ *Ann. des Sci. Nat.* sér. 5, xii. (1869), p. 1.

‖ Sachs remarks as follows on Daubeny's experiments: "Ch. Daubeny, qui s'est occupé de cette question, ne s'exprime qu'avec une extrême prudence, et ses observations ne paraissent pas l'avoir conduit à des résultats positifs."—*Phys. Vég.* p. 251.

¶ *Phil. Trans.* 1836, i. p. 159.

adds, "tended to show that the extrusion of moisture, *ceteris paribus*, was most abundant in proportion to the intensity of the light admitted (orange glass in general causing more moisture to be exhaled than red or green), yet in some instances blue and purple glasses, and, still more remarkably, bottles filled with the cupreous solution [ammonio-sulphate of copper] would cause a more abundant exhalation than orange or even transparent glass. Here, however, another principle seems to come into play, namely, the influence of heat radiated from the surface of the screen."*

Dehérain's researches alluded to above were made upon leaves in a saturated atmosphere, and he came to the following conclusions, amongst others:—†

"1°. L'évaporation de l'eau par les feuilles est déterminée par la lumière et non par la chaleur.

"2°. Cette évaporation se continue dans une atmosphère saturée.

"3°. Les jeunes feuilles évaporent plus d'eau que les anciennes.

"4°. Les rayons lumineux (jaune et rouge) efficaces pour déterminer la décomposition de l'acide carbonique, sont aussi ceux [?] qui provoquent l'évaporation la plus abondante.

"5°. La différence d'action des divers rayons lumineux est encore sensible quand on s'efforce de les amener à une intensité lumineuse égale."

The coloured fluids used by M. Dehérain were as follows:—

"1. Dissolution rouge de carmin dans l'ammoniaque.

"2. Dissolution jaune de chromate neutre de potasse.

"3. Dissolution verte de chlorure de cuivre.

"4. Dissolution bleue de sulphate de cuivre ammoniacal.

"5. Dissolution violette d'iode dans le sulfure de carbone."

The quantity of water "evaporated" in one hour by a leaf of barley, reduced to percentages of the whole weight of the leaf, was as follows: Red 93·6 p.c., yellow 63·4, green 5·8, blue 6·3, violet ·05.

The relative *intensities* of the rays, however, were not estimated in any way. Nor were the lights tested by the spectroscope—a most important and, in fact, necessary procedure, as it is pretty certain that they were not monochromatic.‡

Wiesner's§ researches led him to draw different conclusions from those of M. Dehérain, in that it is not the (optically) brightest part of the spectrum, but those parts which correspond to the absorption-bands of chlorophyll, which are mainly concerned in the process. Later observers, including myself, tend to confirm his views.

A fact of importance, to which he early calls the reader's attention, is the chief difficulty in carrying out experiments successfully, from the ever-varying amount of light (not pure sunshine). He illustrated

* *Phil. Trans.* 1836, i. p. 160. † *Ann. Sci. Nat.* sér. 5. xii (1869) p. 23.

‡ A violet glass of a peculiar reddish tint in my possession transmitted *the whole of the spectrum*, and was therefore useless for experimental purposes.

§ "Recherches sur l'influence de la lumière et de la chaleur rayonnante sur la transpiration des plantes," par M. J. Wiesner, *Ann. des Sci. Nat.* sér. 6. iv. (1876) p. 145.

this by the following experiment: He chose young plants of Maize, having their roots in water, protected above by a layer of oil to prevent evaporation. He placed them in one scale of a balance in equilibrium. He then removed 10 milligrammes; and as soon as the scales were again in equilibrium he removed ten more, and so on. Equilibrium was successively restored after the periods of 6 min. 15 sec.; 7,15; 4,30; 4,20; 7,45; and 5,10. The temperature and humidity were constant. Hence the variations of transpiration could only be accounted for by the unequal illumination of the sky caused by passing clouds.

He also adds several experiments showing the great differences which result between the effects of bright sunshine, diffused light, gas, and in obscurity, and concludes with the remarks: "Dans tous les cas, ces quelques expériences montrent qu'on s'expose à de graves erreurs quand on étudie l'action de la lumière sur la transpiration sans tenir compte des changements de l'éclairage."

Unfortunately the intensity of light is just the one thing which at present it is impossible to estimate with great accuracy.

The next point of importance to which WIESNER draws attention is the part which the ultra-red calorific rays play as a cause of transpiration.

"J'ai fait moi-même deux séries d'expériences avec de jeunes Maïs et des rameaux d'If. Seize expériences à la lumière solaire et à la lumière du gaz m'ont conduit à ce résultat: *que les rayons calorifiques obscurs agissent très-fortement sur la transpiration, et que cette influence, relativement à celle des autres rayons du spectre, est plus grande quand on se sert de la lumière du gaz que quand on opère à la lumière solaire.*"*

After detailing his methods of experiment he concludes: "Il y a entre la valeur calculée de la transpiration à l'obscurité et la valeur observée une différénce de 11 pour 100.

"En passant sur ces erreurs d'expériences, on trouve d'une manière approximative que pour 100 d'eau transpirée, 79 reviennent aux rayons lumineux et ultra-violets, et 27 aux rayons calorifiques obscurs."

It is worth while to recall the fact that DAUBENY in 1836 perceived the importance of heat-rays. He attributed the excess of transpiration under blue, purple, and the cupreous solution, in great part to the heat radiated from the screen, for "a bottle filled with water, blackened with ink to such a degree as to transmit just as much light so far as could be measured by the eye, as that filled with the copper solution was found to do, caused an equally considerable amount of water to be evolved by the plant. . . . Now as water, with the addition of a little ink, is known to absorb the rays proceeding from all parts of the spectrum in an equal ratio, it follows that the effect produced in either instance must be ascribed to the heat radiated, and not to any peculiar virtue of the violet extremity in stimulating the vegetative functions."

* "La flamme du gaz donne bien plus de rayons calorifiques que de rayons lumineux (Tyndall)."

"Yet," WIESNER concludes, "the presence of some light seems essential to the due continuance of the process."

In ascertaining the amount of transpiration induced by different rays of the spectrum, WIESNER adopted two methods: first, by placing the plant in certain rays of the spectrum itself; and, secondly, under coloured fluids. The results were mutually corroborative.

The following were the results by the first method: Red gave 136 milligr. per hour; yellow-orange, 122; blue, 146; ultra-violet, 70; obscurity, 62. He next compared these results with others from leaves placed as accurately as possible in the parts of the spectrum corresponding with the absorption-bands of chlorophyll. These latter gave the following results:

Red (with absorption-band No. I.) . .	34·3	milligr.	per hour.
Yellow-orange (between bands II. and III.)	32·0	,,	,,
Green (between IV. and V.) . . .	30·4	,,	,,
Blue (corresponding to band VI.) . .	38·7	,,	,,

From this he concludes: "Il est donc bien évident que ce ne sont pas les rayons les plus lumineux, les rayons jaunes, qui favorisent le plus la transpiration; mais que cette faculté est répartie dans tout le spectre, de telle manière que les rayons les plus actifs sont précisément ceux qui correspondent aux sept bandes noires du spectre de la chlorophylle.

"Il est curieux d'observer la plus forte transpiration dans les rayons qui correspondent à la bande VI. M. VON WOLKOFF a fait voir récemment* que c'est dans cette partie du spectre chlorophyllien que se fait la plus puissante absorption de lumière.

"Les parties du spectre situées entre les bandes d'absorption, et qui sont toujours plus ou moins obscurcies par le passage à travers une solution de chlorophylle, ne sont pas sans action sur la transpiration; mais cette influence est inférieure à celle des rayons complètement éteints dans cette solution."†

That the presence of chlorophyll is intimately connected with transpiration is clear from the different results obtained by WIESNER with etiolated and green plants as well as from those obtained with coloured flowers, to which the reader is referred for further information.‡

My object in pursuing analogous experiments to those of WIESNER

* "Die Lichtabsorption in den Chlorophyllosungen." Heidelberg. 1876.

† *Ann. Sci. Nat.* sér. 6. iv. (1876) p. 169.

‡ *Ann. Sci. Nat.* sér. 6. iv. (1876) p. 157. For additional information corroborative of WIESNER the reader may consult *Memorie della Reale Accademia dei Lincei* (1879-80), and an abstract in *Comptes Rendus*, xci. p. 6. August 9th, 1880, the general conclusions of which are as follows: "Apart from, and in addition to, other factors which promote evaporation, the actinic influence of light largely affects transpiration in plants. Plants transpire more in light than in darkness, and more in proportion to the intensity of the light. The effect is therefore most marked just after midday. Only the portion of light absorbed produced this effect: consequently highly coloured plants are more affected than others. Plants transpire least in monochromatic light than in their own colour, and most in the complementary colour. Thus, a green leaf transpires least in green and most in red light, other conditions being the same." (*Hort. Journ.* 1880.)

was to try to test his conclusions, using, however, coloured glasses instead of fluids; and the results I have obtained all tend to corroborate his.

It is impossible to ascertain *absolutely* the amount of water transpired which is due to any particular band of colour in the solar spectrum; for the difficulties are insuperable. To say nothing of other influences at work to aid in the elimination of water, such as external and internal variations of temperature, dryness of the air, and, above all, variations in the intensity of sunlight, it is impossible to get glasses monochromatically pure in any colour excepting red. Hence the results cannot be more than relative or approximately true. Such as they are, however, I find, like WIESNER, that the largest amount of water transpired is coincident with those parts of the spectroscope wherein lie the strongest absorption-bands of chlorophyll.

CHARACTER OF THE COLOURED GLASSES.—Before giving the results of my experiments, it will be desirable to describe the character of the glasses employed.

Red.—This is a pure monochromatic ruby-red, which transmits no other rays whatever besides red light; and it is that portion of the spectrum which contains the very strong chlorophyllian absorption-bands Nos. I. and II. The thickness of the glass is one-tenth of an inch.

Yellow.—This glass passes not only the yellow, but all the red and green rays as well, up to F in the blue; but stops the rest of the most refrangible half of the spectrum. As this glass not only transmits yellow and green which contain the fainter chlorophyllian bands II., III., and IV., but the powerful one No. I. as well, one would, on *à priori* grounds, infer that *more*, and not *less*, transpiration would occur with yellow glass than with red; but such is not usually the case. Moreover, the loss of water under ordinary clear colourless glass (one-twelfth of an inch in thickness) is sometimes less than under either red or violet glasses alone; so that from these facts one is led to infer that the presence of the brightest or yellow rays is an actual impediment to transpiration, or in some way hinders the action of the red and violet. The thickness of the yellow glass used is one-twelfth of an inch.

Green.—This excludes red and violet rays, but transmits light which includes the position of the chlorophyllian bands III., IV., V., and VI. It is one-twelfth of an inch in thickness.

Blue.—This has the red end greatly subdued, appearing quite black in diffused light; but in direct sunlight a broad black band is seen in the midst of a small quantity of dull red. It includes green; but a black band in the position of the chlorophyllian band No. IV. Hence the glass transmits light which would include the bands No. V., VI., and VII. The thickness of the glass is one-tenth of an inch.

Violet.—This passes less green, but rather more red, than the blue glass. The light transmitted would include bands Nos. II., V., VI., and VII. A dark absorption-band occurs about the position of No. IV.

Clear.—Ordinary transparent colourless glass, of a thickness of one-tenth of an inch.

Nature of Experiments.—In commencing my experiments I at first employed cut shoots and detached leaves of various plants, as has so generally been done by previous experimenters. In every case they were weighed both before and after their exposure for definite periods to daylight transmitted through the coloured glasses. Different methods were adopted; but the most satisfactory for short periods, such as are indeed only possible with detached specimens, was to cut the shoot under distilled water, inserting it in a small test-tube submerged at the same time. This secured the cut end from exposure to the air. The surface of the water in the tube was prevented from evaporating by a few drops of oil forming a thin layer. The whole is easily and accurately weighed to the 500th part of a gramme. The tube with the shoot or leaf thus prepared was enclosed in a box covered above with the sheet of coloured glass.

Although experimenters have so generally employed cut shoots and leaves, I soon found, on making my calculations from data accumulated from the weights, that although some may appear quite fresh to the eye for three or even more days after the commencement of the experiment, yet the vitality of the shoot or leaf had, nevertheless, been becoming enfeebled all the while, and the amount of water transpired steadily decreased day by day irrespective of the characters of the coloured glasses used; so that finally the relative amount of loss in successive days became untrustworthy.

To ascertain the differences in the amount of water transpired under the influence of different rays of the spectrum, prolonged and repeated exposure of the same specimen to the same kind of light is necessary. The reason for this is obvious; for there are (as stated above) so many disturbing influences which may materially affect the results, that unless they be reduced to a minimum the effect due to colour alone cannot be even approximately ascertained.

If, however, the experiments be carried on under conditions which will reduce the above disturbing elements to a minimum, then the differences due to the colour of the light transmitted will be the most powerful agent in the process of transpiration; and it is only by taking the mean of many experiments that the above influences can be virtually eliminated.

In attempting to do this with cut specimens, none will be found to last long enough unaffected by the lesion to give very trustworthy results. Hence, although such experiments may tend to corroborate those obtained by more perfect methods, yet I do not think it worth while to enumerate more than one or two of my own, numerous as they have been, as by themselves they would not furnish a sufficiently accurate basis for induction. They may have their use, however, in showing the somewhat negative, or at least uncertain, results which are generally only obtainable from cut specimens.

The next method I adopted was to take small plants with their roots carefully lifted and freed from soil, and to insert them in test-tubes as before. The results were even more unsatisfactory than with cut specimens, for, excepting Radish (the thick root of which presumably acts as a reservoir of water), the others, having fibrous roots, gave a steadily decreasing loss day by day, showing no maximum or minimum, except in some cases with clear glass on the sixth day, on which the loss was greater than on the preceding.

One suspects, therefore, that roots naturally grown in soil and transferred to water, cannot carry on their function of absorption in a normal manner beyond a very short period of time. My experience seems to corroborate that of Sachs*, quoted by Duchartre† :—"Ce physiologiste a reconnu que les racines qui se sont produites dans la terre ne peuvent végéter ensuite dans l'eau et que réciproquement celles qui ont pris naissance dans l'eau ne peuvent remplir leurs fonctions dans la terre."

The plan I finally adopted was to grow small plants in miniature pots, two inches high and nearly two inches in diameter. These can be entirely wrapped up in gutta-percha sheeting, which is carefully bound round the stem of the plant with cotton-wool within and around the stem. This effectually prevents any evaporation from the surface of the earth or pot; and all loss of weight is due to the transpiration from the exposed surface of the plant alone‡.

My experiments were made upon lettuce, box, *Echeveria*, small seedling palms, ferns, cacti, and many other kinds of shrubs and herbs; having selected them with very various degrees of density in the epidermis, as well as of different families. The results would seem to entirely corroborate the conclusion of Wiesner, that transpiration is mainly effected by the Red, Blue, and Violet rays; while the (optically) brightest rays of yellow and green are generally less able to effect it, *even if they do not hinder it*. I emphasize this sentence, as there appear to me to be grounds for coming to such a conclusion.

Description of Experiments.—The experiments were all conducted in a room with one window of north aspect, into which the sun never entered, except just before setting in midsummer, and then only at one corner of the window. The light was, moreover, partially obscured by foliage of high trees in front of it. The window was never opened, and the temperature varied but very little, the maxima ranging from 61° to 66° F. by day and the minima from 57° to 61° by night, so that the effects from this cause may be practically put on one side. Similarly the humidity of the air of the room may be neglected. They were all carried on between the months of May and September.

* *Bot. Zeit.*, 1860, p. 113.

† *Eléments de Botanique*, 2me éd. 1877, p. 289.

‡ Even in this case we meet with a difficulty, in that after several days the absence of air to the roots is liable to cause small and delicate plants to suffer; so that other precautions must be taken with them, in not allowing the soil to be too wet, and in admitting air from time to time.

I selected six young lettuce plants on May 15 and May 23 respectively, from a bed, and transferred them to miniature pots. They were allowed to become well established, and then the pots were completely invested in gutta-percha sheeting as described. Each plant was placed under the coloured glasses in succession for twenty-four hours, with the following results (loss in grammes):—

Lettuces (first series).

Mean Temperature 64°.

No. of Pot.	Red.	Yellow.	Green.	Blue.	Violet.	Clear.
I. . .	1·09	1·16	1·06	1·29	1·47	1·29
II. . .	·61	·07	·55	·72	·95	·61
III. . .	1·05	1·16	1·22	1·25	2·16	·63
IV. . .	1·43	1·05	1·16	1·16	1·92	1·72
V. . .	1·11	1·09	·89	1·02	1·48	1·13
VI. . .	1·39	1·62	1·48	1·21	1·75	1·50
Total .	6·68	6·15	6·36	6·65	9·73	6·88

The temperature during the six days occupied with this experiment varied only eight degrees, from 56° to 64° F.; and to show how little this affects the results, the temperature for pot I. under red glass ranged from 59° to 64°, while that for the same plant under yellow glass was from 59° to 62°; and yet in this instance the yellow glass gave a rather higher loss than the red. Again, for No. II. the temperature for red glass varied from 59° to 60°, that for yellow from 59° to 64°, showing that in both cases the temperature was *lower*, when the loss was comparatively *greater*, contrary to what would be expected, since it is known that an elevation of temperature is one of the causes of increasing the loss of moisture. The differences, therefore, must be put down to the unascertainable variations in the amount of sunlight.

Hence will be seen the importance of a protracted series of experiments; and the results given under the line of "Totals" will undoubtedly be a much nearer approximation to the truth.

These give one maximum for the red and another for blue and violet, together; while yellow and green, singly or together, furnish decided minima.

An independent maximum is also supplied by clear glass. Comparing this with the effects of the yellow glass, which also transmits red light, it seems that so far from the optically brightest rays being a chief cause of transpiration, the yellow, and those rays on the more refrangible side of it, where the chlorophyll absorption-bands, viz. Nos. II., III., and IV., are feeblest, *must have actually a retarding influence upon the effect of red and violet lights*, which *per se* are most powerful.

Lettuces (second series).
Range of Temperature 57°-66°.

No.	R.	Y.	G.	B.	V.	Cl.
I. . .	1·13	1·05	1·04	1·15	1·42	1·54
II. . .	·81	·54	1·02	·33	1·08	·68
III. . .	1·22	1·20	1·12	1·50	1·55	1·35
IV. . .	1·89	1·10	1·87	1·54	1·59	1·39
V. . .	·92	1·35	·97	·73	1·20	1·33
VI. . .	1·93	1·40	1·29	1·50	2·41	1·58
Total .	7·90	6·64	7·31	6·75	9·25	7·87

As in the preceding series, one maximum occurs under the red, another under the violet or most refrangible end, while yellow is again a minimum. Green gives a rather higher result than before. Combining the two series, the mean of the two totals is as follows:—

R.	Y.	G.	B.	V.	Cl.
7·29	6·39	6·98	6·70	9·49	7·37

This result clearly shows the preponderating effects of the red and violet ends of the spectrum; and they are, of course, just where the strongest chlorophyllian absorption-bands occur.

Clear glass gives a decided maximum, though in many cases the loss is less than under violet alone; hence I would repeat, and I believe the observation has not been made before, that yellow light has a decidedly retarding influence upon the amount of water exhaled by red and violet lights.

Though such is the case with the rapidly transpiring herbaceous leaves of the lettuce, it appears to be somewhat different with palms and box, as the following series will show; for out of ten observations on palms, on seven occasions the loss under clear glass was greater than under violet, and on six occasions greater than under red. With lettuces the loss under clear glass was on as many occasions greater than that under the red glass as the reverse. In the case of the box, however, the loss under red and violet was always greater than under clear glass. But the preponderance of red over yellow is not so pronounced as with lettuces.

Lettuces (third series).
Range of Temperature 53°-58°.

No.	R.	Y.	G.	B.	V.	Cl.
I. . .	·70	·62	·43	·44	1·07	·46
II. . .	·30	·27	·81	·49	·55	·62
III. . .	·80	·55	·77	·59	·89	·62
IV. . .	·58	1·10*	1·45*	·72	1·83	·70
V. . .	·29	·43	·72	·30	·81	·59
VI. . .	1·44	1 41	1·24	1·76	·97	2·13
Total .	4·11	3·28	3·97	4·30	6·12	5·12
Mean .	·68	·65	·79	·71	1·02	·85

The numbers with asterisks are omitted in calculating the means, as the foliage had become partly flaccid, and they are undoubtedly too high. It was on these two occasions that I first realized the important difference between evaporation from dying or dead matter and transpiration from an actively growing or living plant. Subsequent experiments have proved that evaporation proceeds much more rapidly when life is enfeebled or extinct than when the plant is alive. In the latter case this purely physical process is to some extent kept in check, while transpiration, so to say, takes its place.

Taking the mean of the three series, the results are as follows:—

R.	Y.	G.	B.	V.	Cl.
5·09	4·46	4·82	4·70	6·66	5·20

These give decided maxima under red, violet, and clear glass, with minima under the central portion of the spectrum.

Box.

Six small box plants, well rooted, were grown in pots as described, with the following results after twenty-four hours' exposure in each case.

Range of temperature 57°-65°.

No.	R.	Y.	G.	B.	V.	Cl.
I.	·75	·65	·76	·81	1·00	·74
II.	1·37	1·37	1·38	1·23	1·52	1·14
III.	1·30	·88	1·21	1·04	1·48	1·17
IV.	1·71	1·96	2·63	2·47	2·82	1·43
V.	3·48	3·64	3·72	3·54	3·15	2·40
VI.	2·58	2·91	2·33	2·83	2·67	2·35
Total	11·19	11·41	12·03	11·92	12·64	9·23
Mean	1·36	1·90	2·00	1·98	2·10	1·54

In this, evergreen with a thick cuticle to the leaves, the differences are not so pronounced; but violet glass still shows a maximum.

Experiments with palms also showed the necessity of making a prolonged series with the same plants; for the totals might even taken alone lead us to suppose that the yellow glass was most favourable of all the colours; but variations of sunlight, coupled with slight variations of temperature, may account for it. Thus, when the yellow glass gave a loss of ·97 gramme, and red only ·70, the temperature ranged from 63° to 66° with the former, and only from 61° to 64° with the latter on June 28, 1883. Again, yellow gave a loss of ·88 gr. on July 16, with a temperature ranging from 57° to 62°; but on the day before the red glass gave a loss of ·75 gr., while the temperature ranged from 59° to 64°; hence, in all probability, it was a duller day.

These irregularities, however, become eliminated when so large a series of observations as eighteen for each colour are taken; for I consider the proof of their elimination to reside in the general

agreement of their results with those of other plants treated in the same way.

Cactus.

A small specimen of a cylindrical cactus, growing in a pot and protected as described, gave the following results:—

No.	R.	Y.	G.	B.	V.	Cl.	Range of temp.
I. . .	·12	·11	·07	·08	·05	·12	44°—52°
II. . .	·01	·15	·04	·16	·05	·10	40°—53°
III. . .	·18	·27	·10	·17	·12	·14	54°—63°
IV. . .	·13	·25	(?)	·07	·23	·03	54°—61°
V. . .	·22	·14	·21	·03	·26	·15	55°—64°
VI. . .	·18	·17	·15	·21	·12	·07	54°—60°
Total .	·84	·99	·57	·72	·83	·61	44°—64°
Mean .	·13	·16	·11	·12	·14	·10	54°

In this case yellow glass gives a higher loss than red; and as this also occurred with box, and with one of the palm series, but with neither of the lettuce series, one is led to imagine that the character of the epidermis may be an important factor, and alter the effect of the light.

Fern.

A small fern, apparently a species of *Asplenium*, was experimented with, simultaneously with others. It gave the following results:—

No.	R.	Y.	G.	B.	V.	Cl.
I. . .	·78	·77	·86	·72	·77	·83
II. . .	·87	·66	·83	·60	·79	·50
III. . .	·76	·86	·62	·65	·67	·75
IV. . .	1·54	·87	·84	1·15	1·03	1·33
Total .	3·95	2·96	3·15	3·12	3·26	3·41
Mean .	·99	·74	·79	·78	·81	·85

This result obviously agrees with the preceding.

The above experiments, selected from a large series, seem to me to abundantly prove that WIESNER's results are correct; and, while recognizing the fact that obscure heat-rays cause a certain amount of the loss of water by evaporation, that transpiration *per se* (theoretically distinct from the purely physical process of evaporation, which takes place from all moist surfaces and bodies, dead or alive) is especially, if not solely, referable to those particular bands of light which are absorbed by chlorophyll, and that such light, being arrested, is converted into heat, which then raises the temperature within the tissues and causes the loss of water.

I am not aware of any attempts to ascertain the exact amount of difference between evaporation, due to heat alone, and to transpira-

tion, due to light. From my own experiments I have found very marked differences in the amount of water lost in the same times and conditions, as well as in the *rapidity* with which desiccation takes place under the two processes. Such, at least, obtains when one-half of a living leaf transpired under sunlight; while the other half, *having been suddenly killed by scalding*, could only evaporate. An important paper indirectly bearing upon this subject is one by M. MAQUENNE, entitled "Recherches sur la détermination des pouvoirs absorbants et diffusifs des feuilles" (*Annales Agronomiques*, tom. 6, 1880, p. 321).

A discovery of MAQUENNE's (which would seem to furnish an important aid to distinguish between the two processes evaporation and transpiration) is that older leaves absorb more heat than the younger ones of the same kind, and evergreens more than deciduous leaves; yet, according to DEHÉRAIN, it is exactly the reverse which transpire the most. Hence, if this function be identical with the purely physical process of evaporation, it would be difficult to reconcile the above fact with it.

In order to test the relative effects of transpiration upon colourless plants, I experimented with mushrooms and blanched sea-kale, so as to avoid the effects of chlorophyll.

The mean results of four specimens under coloured glasses were for the mushroom:—

R.	Y.	G.	V.	Cl.	Dk.
·030	·027	·028	·030	·037	·027

These results agree with those from plants possessing chlorophyll, so far as the maxima under red, violet, and clear glasses are concerned; while yellow, green, and total darkness give minima.

If one neglects the third place of decimals we may write the above thus:—

·03	·03	·03	·03	·04	·03

This result shows that the differences between the effects of any particular colour is really almost inappreciable, whereas the augmentation under clear—*i.e.* colourless, glass is more pronounced.

One great point of difference between transpiration and evaporation consists in the relatively greater quantity of water lost, and that with a greater rapidity, by evaporation as compared with transpiration. Then—*e.g.* the mean loss by transpiration under all lights of a plant of *Echeveria* was 0·33 gr. per hour; while the same plant, scalded to death, evaporated ·068 gr. per hour under a very similar range of temperature. The inference is, that living protoplasm has a power of controlling and regulating the loss of water which a dead organic structure does not possess.

The third important function of plant-life is respiration or breathing, a process consisting of an oxidation of carbohydrates, as sugar, &c., thereby liberating energy for the use of the plant's growth, as well as carbon dioxide and water as waste products. It is precisely

the same process as in a candle burning, energy in the form of light and heat is evolved, with CO_2 and water.*

The stimulus for respiration is not light, *per se*, though light may be converted into heat, but the obscure heat-rays beyond the visible red end of the spectrum.

It has been found by experiments that, when plants are subjected to gradual increments of temperature in total darkness, the amount of CO_2 given off increases proportionately with the increased degrees, so that a curve drawn is a parabola.† This signifies that there is no cessation until death ensues; though the *optimum* temperature is 75° to 85° F.

It has been lately shown that colours in plants, other than the green of chlorophyll, are, primarily, means of respiration; in that there are "enzymes" or ferments which are called "oxydases."‡ These respiratory enzymes (not acting directly upon the hydrocarbons), oxidize the "chromogenes"—*i.e.* "colour-begetters," which thereby become pigmented or coloured solid or liquid bodies.

It is these chromogenes, enriched by the oxygen of the oxydases, which now oxydize the hydrocarbons and fats.

To show how extended the chromogenes are, if a potato or apple be cut in halves and exposed to the air, the oxygen soon turns them brown. Some fungi (as *Boletus luridus*) turns blue.

The red colouring of living autumn leaves, as of *Mahonia*, is due to an accumulation of respiratory pigments. Red sea-weeds, which live in the deeper zones below low-water of our shores, have green chlorophyll, but it is masked by the red fluid. If they be scalded, the green becomes visible. Now, the light which reaches the sea-bottom is mainly blue-green, the other rays having been absorbed by the water, but, as blue rays§ are also capable of bringing about photo-synthesis as well as red and red-orange, the chlorophyll can utilize the former. But as to respiration, it would seem that the use of the coloured fluid is to act as an oxygen carrier, by some means extracting it from the air in the water, for, as oxygen is so greatly reduced in quantity compared with that in the atmosphere, sea-weeds, like fishes, might be called "cold-blooded," the coloured pigment acting as an assistant to respiration which is probably much feebler than in aerial plants.

Perhaps a similar interpretation may be given of the fact that red, purple, and blue pigments are very general in the foliage of high alpine and arctic plants, which are mostly deficient in starch, but have sugar

* To *see* the water, let a *cold* spoon be held over and close to the tip of the flame. Visible moisture is at once condensed upon it; but, of course, it will be quickly dissipated by the heat.

† See article by MM. Bonnier et Maugin on "The Respiration of Leaves in Obscurity," *Annales des Sciences Naturels*, xix. 1884, p. 253; *ibid.* 6th ser. xvii. p. 267.

‡ An article on the presence of Oxydases and Peroxydiastases in seeds will be found in *Révue Générale de Botanique*, vol. xxi. 1909, p. 55. Also one on "The Distribution and Formation of Respiratory Chromogens," *op. cit.* p. 124.

§ As I have elsewhere shown—*Journ. R.H.S.* 1893, "On the Effects of Growing Plants under Glasses of Different Colours."

instead. May not these pigments therefore convey more oxygen and so increase the respiratory power by means of the sugar, and so aid a low vitality? The mean temperature is low, and as respiration is increased by heat, so this may be a means of increasing it in lieu of sufficient warmth. It is worthy of note that the green colour of chlorophyll fails to appear if the temperature be insufficient. If any plant, say a blue-bell, be dug up having the lower part of the leaves yellow, and planted again, though now exposed to the light, they will not turn green as long as the weather remains cold.

Similarly, many leafless plants, as broomrapes, dodder, and other parasites or saprophytes, including fungi, are white or oftener more or less coloured, and are aided by respiratory chromogenes. It has been found that *Orobanche Teucrii* in full bloom used up its own volume of oxygen in thirty-six hours, *i.e.* 4·2 c.cm. to each gram of substance, corresponding to a loss of 2·26 mgr. of carbon.*

It is well known that the loss of CO_2 by respiration, with the corresponding rise in temperature, occurs especially in flowers. May not, therefore, the prevailing yellow colour of the anthers and pollen in Gymnosperms, the earliest flowering plants, and subsequently in Angiosperms, be connected with this object?

Not being green, flowers might be called parasites on the plant, and that is perhaps Nature's method of supplying the pollen with oxygen for energy to carry on the processes of nuclear divisions within the grain. So, too, chromogenes would supply the means for respiration during the process of growth and development of the petals, but ceases as soon as fertilization has been secured. These are at present merely speculative and hypothetical questions for futurity to answer.

It must be borne in mind that it is *not* the carbohydrates which respire, but the living protoplasm, but this loses nothing. The protoplasm begins the work of respiring, but the decomposition of starch, &c., is done by this *living* material.

Sachs had long ago observed of the red colouring matters that "they give remarkable spectra with one absorption band. Some are connected with albuminous substances in much the same manner as the hæmoglobin of blood, being like it decomposed at exactly the same temperature as that at which albumen coagulated. . . . They are especially characteristic of red Algæ."†

There is yet another result accruing from respiration, and that is the phosphorescent-like illumination of the mycelia of certain fungi. It has been noticed that *Agaricus olearius* in the phosphorescent condition forms much more carbon dioxide than when it is not luminous. But as respiration is reduced when the temperature is lowered, it has been found that the phosphorescence is very quickly lost. It disappears at 35° or 36° F. The maximum temperature reached was 46°-50° F.‡

There remains one more illustration of the use of the spectroscope in the study of plant life. Heliotropism, or rather phototropism, is the

* Sachs' *Physiology*, p. 399. † *Text-book of Botany*, 2nd edit. p. 766.
‡ Sachs' *Vegetable Physiology*, p. 407.

result of the direct action of the more refrangible half of the spectrum; for Sachs' experiments with solutions of potassium bichromate, which allows the red, orange, yellow, and part of the green rays to pass, showed no heliotropic action to take place. But, if light passes through a solution of ammoniacal oxide of copper, which is dark blue, and allows violet and ultra-violet to pass, then heliotropic movements occur. The same results followed the use of cobalt-blue sheet-glass, and ruby-red instead of the orange-coloured potassium chromate.

Sachs, however, mentions that others have obtained different results, finding maxima in infra-red and ultra-violet rays.*

* Sachs' *Vegetable Physiology*, p. 696.

FRUIT PRODUCTION OF THE BRITISH EMPIRE.*

By the Hon. JOHN MCCALL, M.D., Agent-General for Tasmania.

WHEN SIR WESTBY PERCEVAL asked me to read a paper on fruit to the members of this society, I was under the impression that I had been selected to do so on account of my official connection with one of the important fruit-growing centres of the Empire—viz. Tasmania, which has a world-wide reputation for the lovely apples grown there. Believing this, I readily assented, as it appeared to me a splendid opportunity of singing the praises of an important product of my own State. When I was tuning myself up for this effort the Secretary of the Section interviewed me on the subject, and my mind was disabused when he informed me that I should be expected to talk of the fruit production of the whole British Empire. For days I could think of nothing but fruit, and the more I thought of it the more I realized the difficulties of the task I had undertaken. I could see no way out of it, so asked for time. This being granted, I worried over how I should treat my subject within the reasonable limits of a single paper. I consulted all my friends who had had to do with fruit, but could not make up my mind or have it made up for me. I read everything that had been written on fruit from the time the innocent apple had been plucked in the Garden of Eden and worked so much mischief in the world, right up to the present day, and then with a feeling of impending melancholia I put away the literature in order to save my reason. After a time I returned to the consideration of the subject, and decided that the members of such a body as the Royal Society of Arts would not desire that I should attempt to instruct them in the art of growing fruit, or salivate them by sweet descriptions of the various luscious fruits to be found in different parts of the Empire. I concluded that I might render a real service if I could compile statistics of the fruit production in the different parts of the Empire, and by so doing demonstrate the great importance of the fruit industry. This I have decided to make the main feature of my paper. I trust the result of my labour may be found interesting to all, and to those who require the information I have collected I can say that I have saved them an immense amount of trouble, as it has been much more difficult to obtain this information than anyone would suppose who has not actually attempted to collect it. Before submitting the results of my research, permit me to say that in many parts of the world fruit is acknowledged to be quite an important part of the diet of the people, and to many it serves, when taken regularly, as a medicine of great

* A Lecture delivered before the Colonial Section of the Royal Society of Arts, March 1st, 1910, and reprinted, by kind permission, from the *Journal of the Royal Society of Arts*, March 25, 1910.

value, saving quite a large proportion of our population the necessity of consulting the physician and the unpleasantness of drinking his nasty drugs. The growing of fruit is quite an aristocratic occupation, and in most countries a highly profitable one. Speaking for the State I know most about, where the growing of apples is made a very special business, quite small orchards return handsome incomes to their owners. The official estimates of returns supplied to me from Tasmania show a profit of about £40 per acre from apple-growing, so that an orchard of 25 acres will return the careful orchardist an income of £1,000 a year. I gather that the growth of many varieties of tropical fruit gives even a greater return, though the conditions of life for the grower may not be so pleasant or healthy. The fact that so many varieties of fruit will grow on inferior soil, and by inferior I mean unsuitable for general agriculture or mixed farming, enables large tracts of land to be used that would otherwise be waste; further, it permits of closer settlement, and increases the capital value of lands of a country and also its trade.

To give some idea of how it increases the trade of a country I need only mention that in the case of a small State like Tasmania, with quite a small population, the export of about half a million bushels of apples to the United Kingdom is sufficient to induce all the mail steamers and most of the large liners trading to Australia to call regularly during the apple season at Hobart, the capital of the State. When it is remembered that these mail steamers carry hundreds of passengers, whose spending capacity is great, the advantage of the trade to Tasmania, it will be seen, is not limited to the return made to growers for their output of fruit. I have named Tasmania because I know, from my own knowledge, that if it were not for the fruit trade these steamers would not call there, as the shipping in connection with most of our other industries would be conducted by smaller vessels carrying to and transhipping into larger vessels at one or other of the great shipping ports of the Commonwealth. We must, therefore, credit the fruit production with the whole of the trade advantages secured. As it means so much to a very small spot in the Empire, what must it mean to the larger States and Dominions, and to the Empire as a whole? Of all land industries, viewed from the standpoint of importance to the Empire, I claim that the fruit industry follows immediately after wheat and wool. I should perhaps mention that another important industry connected with fruit-growing in temperate climates is jam-making, while in tropical and sub-tropical countries we have the dried-fruit industry and the manufacture of wine. Every variety of fruit and every industry connected with fruit flourishes in some part of our great Empire; in this connection the Empire can claim to be independent of other countries.

Cold storage and the drying of fruit secures for the residents of one part of the Empire the advantage of being able to enjoy the fruit of the most distant parts. If it is not quite equal in quality after the lengthy journey and treatment, it is still a wholesome food possessing

all the health-giving qualities of fresh fruit. I believe it is to the citizens of the most distant outpost of the Empire (Tasmania) that the credit is due for having made the early experiments in connection with the carriage of apples in cool store over long sea distances. It was found necessary for them to secure other markets for their surplus, and though at the time England was expected to consume all the surplus, as a matter of fact fruit is so carried to many other parts of the Empire and in increasing quantities to other countries. If it be thought I dwell too much on apples I would justify my remarks by saying that of all fruit imported into the United Kingdom from other parts of the Empire, apples represent by far the greatest in aggregate value. When I mentioned that inferior land has been made very valuable by the introduction of fruit-growing, I had in my mind only the land that required no special treatment by way of preparation, but in Australia, in addition, at Mildura, in the State of Victoria, loamy wastes have been converted, by means of irrigation, into most valuable fruit-growing lands; there, sub-tropical and tropical fruits grow luxuriantly, and it is hoped that the extension of this great work will enable Victoria to supply dried fruits in sufficient quantities to satisfy the demands of the Commonwealth, and to contribute largely to the wants of the Mother Country.

There are subsidiary interests in connection with fruit-growing besides jam-making and wine-production: there is basket-making for small fruit, bottles and tins for fruit and pulp, timber for cases and barrels; and another industry I hope to see extensively taken up in connection with orchards is the keeping of bees, for it has been successfully demonstrated that cross-pollination—*i.e.* introduction of foreign pollen into the blossoms—improves the size and quality of the fruit. For this purpose nothing can be better than keeping bee-hives in the orchards or in very close proximity to them. It will be at once seen that the introduction of bees in connection with orcharding secures two extra profits for the orchardist—the improved value of the fruit and the return from the honey. If properly attended, each hive may be expected to give a return of 200 lb. weight of honey—under the old system, I believe, 80 lb. was the highest amount obtained.

I shall now incorporate the figures I have been able to compile showing the total area under fruit in the various divisions of the Empire:—

ACREAGE OF ORCHARDS AND VINEYARDS IN THE BRITISH EMPIRE.

	Acres.
India (1906-7), including vegetable gardens	4,020,136
Ontario (1908)	338,255
United Kingdom (1907-8)	335,177
Cape of Good Hope (1908)	72,590
Quebec (1907)	77,416
Victoria, Australia (1908-9)	75,105
Nova Scotia (1907)	54,051
Carried forward	4,972,730

ACREAGE OF ORCHARDS AND VINEYARDS IN THE BRITISH EMPIRE (*continued*).

	Acres.
Brought forward	4,972,730
New South Wales (1908-9)	51,868
South Australia (1907-8)	41,816
New Zealand (1908-9)	29,217
Queensland (1908-9)	25,334
Tasmania (1908-9)	25,146
British Columbia (1905)	22,000
West Australia (1908-9)	18,049
Natal (1905)	37,590
Ceylon	1,016,138
Jamaica	63,029
Total acreage	6,302,917

CANADA.

Canada, in 1901, the last year for which reliable statistics are obtainable, produced:—

Apples	18,626,186	bushels.
Peaches	545,415	,,
Pears	531,837	,,
Plums	557,875	,,
Cherries	336,751	,,
Other fruits	70,396	,,
Grapes	24,302,634	lbs.
Small fruits	21,707,791	quarts.

Since that year the acreage under fruit has been much extended, and the production considerably increased.

Although in the fruit-growing provinces of Canada all hardy fruits, such as plums, apricots, cherries, and strawberries, are largely grown and justly esteemed, yet it must be conceded that it is as an apple-producing country that the Dominion is best known. When it is recollected that apple trees were introduced there prior to 1663, and that the modern orchards of the Annapolis and Cornwallis valleys were founded at the latter part of the eighteenth century, it is not surprising that the production at the present time has reached such enormous proportions and the export trade attained such importance. Ontario alone has an annual average value of the industry of over seven and a half million dollars. Nova Scotia's output of apples alone reaches half a million barrels. British Columbia, which ten years ago did not produce sufficient for its own needs, is now exporting, and has an average value in fruit produced exceeding one million dollars. I regret that it is not possible to furnish full and uniform statistics as to the export of fruit, but the figures and returns of the output for 1901 (the latest available), viz. 20,668,460 bushels and 24,332,634 lb., are eloquent of what has been and is being accomplished in Canada. The nearness of the English market and the fact that the voyage being very temperate and short obviates the necessity for the fruit to be placed in cool stores on board, is a great asset to the grower and shipper,

enabling him to pack and ship more cheaply than his *confrères* of Australia and South Africa. Apart from the importance to Canada of this large export trade, the fact that apples can be delivered here so cheaply is a great boon to the poorer classes, which are unable to purchase fruit at luxurious prices.

South Africa.

No figures are obtainable as to the total production of fruits in South Africa, but grapes are the principal fruit grown, the vineyards being nearly 50 per cent. of the total area under fruit cultivation. Fruit culture in South Africa is practically in its infancy, and every effort is being made by the different Governments to foster an industry which is yearly becoming more important and remunerative. Already we are familiar with peaches, plums, and pines from that part of the world. The Governments of the Cape of Good Hope and Natal have adopted an active policy of encouraging the growers to produce for the English market. This will undoubtedly tend to increased areas under fruit culture, and the produce can be delivered here at a time when fresh fruit is scarce and prices tempting. At the same time, the local demand in the large mining centres must be great, and the supply of fresh fruit to those places should, for a long time, ensure the South African fruit-grower from the bugbear of over-production. I am not, however, losing sight of the fact that carriage to such centres may be at once difficult and costly. Viticulture is practically confined to the Western Province of the Cape of Good Hope. About 50 per cent. of the orchard area of that Colony is under vines. Experiments are still being conducted with a view to ascertaining the best and most economical method of shipping grapes, and the best kinds to send, nevertheless the import of grapes to this country last year reached the satisfactory total of 32,323 boxes. Apples are not grown to any extent, but it has been proved at the Hex River Valley fruit-growing district that they can be cultivated and brought to a high state of excellence. It is simply a question of locality. Peaches, pears, plums and apricots, and many other temperate fruits, grow in the west of Cape Colony, certain parts of the Karoo midlands, and in the higher altitudes of Natal. Citrus fruits, such as oranges, lemons, grape fruit, naartjes, &c., are grown in profusion, and of excellent quality, in every province of the new Dominion and Rhodesia. Pines are grown in the eastern parts of Cape Colony and also in Natal. In the last-named province, bananas, custard-apples, pawpaw, and many other tropical fruits are produced. The only drawback in South Africa known to me is the fact that the timber for fruit boxes has to be imported.

India.

Although it is not possible to obtain detailed figures as to the production of fruit in India, some remarkable statistics are furnished as to the acreage under orchards and garden crops in the various provinces.

Eastern Bengal and Assam head the list with over a million acres; then Madras, with close on a million. Bengal has three-quarters of a million, the United Provinces nearly half a million, and Burma four hundred thousand; these Provinces between them account for 3,582,148 out of 4,020,136 acres, the total acreage under such crops in India.

The figures for India are perhaps somewhat misleading, including as they do the acreage under garden crops, of which detailed statistics are not available. Garden crops include vegetables, &c., produced by natives not only for their own use but for market purposes. The large number of Europeans who are resident in India, both for military and civil purposes, has fostered an industry in European vegetables which could hardly have existed and certainly could not have flourished before the advent of the British race. The excellence of the English vegetables now obtainable in large quantities says much for the efficiency of the native gardeners, and such products as the potato, turnip, radish, and even the homely cabbage, are readily obtainable for the table. The market gardens and those supplying the native wants in this direction would probably account for a large portion of the area under fruit and garden crops. India, with its varied heights, soils, and climates, is able to produce almost any fruit grown in other parts of the world. In the hills are to be found such temperate fruits as the apple, pear, apricot, peach, &c., which are grown extensively, and the trade in these kinds from Kashmir and elsewhere is a large and important one. In warmer districts, almonds, limes, oranges, and lemons are widely cultivated, and tropical fruits such as the guava, pomegranate, banana, pine-apple, coconut, &c., flourish in the plains and South India. If it were possible to obtain figures on the subject it would probably be found that the mango is the most widely cultivated fruit. At certain times in the year it forms the staple food for millions of natives, and its wide use for many such purposes as chutneys, curries, preserves, &c., must mean the consumption of enormous quantities. The mango plays, and has played, for many centuries, an important part in the dietetic history of India, so much so, that it is involved in the ancient mythology of the country.

Ceylon.

In 1908 Ceylon had 100,765 acres in fruit gardens, but no figures are yet available as to the quantity produced. Probably a large percentage of the produce would be raised for the personal use of the natives. The coconut palm is largely cultivated, 915,373 acres being under it. The importance of this branch of the fruit industry can be gauged by the fact that in 1907 the value of the export of coconut palm products was £1,738,523.

Jamaica.

Fruit forms now one of the principal items of export in this island. The export of oranges in 1907-8 was valued at £77,105, and that of

bananas at £1,038,721. The same year the area under banana cultivation was 62,164 acres. There can be no more striking example of the value of a Government subsidy wisely conferred than the case of Jamaica. A few years ago the country was in a most deplorable state of depression, but the subsidy of £40,000 a year granted jointly by the Imperial and Jamaica Governments enabled the Imperial Direct West India mail service to maintain a fortnightly steam communication with this country, undertaking to bring here 20,000 bunches of bananas by each steamer. The wisdom of this policy is amply proved by the enormous expansion of the industry, the large export trade with the continent of America being supplemented by the trade thus fostered with this country. The export value is now, as I have shown, over a million sterling. The benefits to the inhabitants of these islands, too, must not be overlooked. A nourishing article of diet is placed on the market in such quantities that prices enable the poorer classes to be consumers.

Fruit-growing in the other West Indian Islands is but little carried on, and figures regarding the industry are not obtainable. That some fruit is grown there goes without saying, and some of the islands have an export trade which in the near future may attain to some importance, but, with the exception of Montserrat, where there are about 1,000 acres under limes, it would appear that the industry has not yet reached large proportions.

Fiji.

The published statistics of Fiji are very meagre; the acreage under fruit and the production are not ascertainable. There, however, appears to be an export trade which, in 1907, was valued at £97,678, consisting mostly of citrus fruits.

New Zealand.

New Zealand is not, comparatively speaking, a country where orcharding has attained large dimensions, and does not produce sufficient for the needs of her own population. It is a country of many climates, and hardy fruits grow abundantly in certain places. In the North Island citrus fruits, such as the orange, lemon, &c., grow well, and the industry is capable of much extension.

Australia.

Victoria, during the year 1908, produced 2,509,965 bushels of large fruits, 24,489 bushels of small fruits, 561,679 bushels of grapes, and 121,000 lb. of nuts; also 1,437,106 gallons of wine, of a total value of £655,474. The principal crop was 1,241,826 bushels of apples.

New South Wales.—This State in 1907-8 produced 3,879 tons of grapes and dried fruit, 12,957,216 dozen of citrus fruits, 778,500 gallons of wine, and 28,887 gallons of brandy, of a total value of £523,910. Citrus fruits were the principal crop.

South Australia.—In 1906-7 the State sold 26,369 cwt. of grapes, and produced 2,441,504 gallons of wine, 39,404 cwt. of raisins and currants, 311,538 cases of apples, 141,150 cases of oranges, 37,378 cases of lemons, and 16,164 gallons of olive oil.

Queensland.—In 1908 this State produced 4,239,980 lb. of grapes, 1,651,163 bunches of bananas, 598,794 dozen pineapples, 440,312 bushels of oranges, and 77,698 gallons of wine. The value of the grapes and other fruits was given at £399,754.

Western Australia.—Fruit-growing in this State is at present in its infancy, the principal crop being grapes, of which 90,187 cwt. were produced in 1907, from which 153,755 gallons of wine were made.

Tasmania.—The smallest State in the Commonwealth of Australia is pre-eminently an apple-growing country, the production of which was 1,070,546 bushels for the year 1908-9. Pears are a bad second at 71,306 bushels, and of small fruits 3,110 tons were produced. The export value of fruits for that year was well over £300,000 sterling.

Australia is peculiar, inasmuch as, having large areas of fruit-growing country, it has few indigenous fruits. The flourishing orchards and plantations are the results of enterprise and acclimatisation. In Queensland are grown in abundance sub-tropical fruits, and there is a considerable export trade in pines, bananas, &c., to the sister States. As we come further south, to New South Wales, Victoria, and South Australia, we find large orchards, vineyards, and groves of more temperate varieties, such as citrus and stone fruits. The hardier kinds—viz. apples, pears, plums, peaches, &c.—are mostly to be found in Victoria, South Australia, and Tasmania.

Viticulture has, during the past few years, attained great importance, and there are now over 60,000 acres under vines, producing grapes for the table, and, in 1907-8, 4,450,000 gallons of wine.

As examples of what capital and enterprise can perform, we have the irrigation colonies of Mildura, in Victoria (already referred to), and Renmark, in South Australia. The scientific application of water has converted dry wastes into orchards and vineyards, each a centre of considerable population, and annually adding largely to the prosperity of the community. Victoria and South Australia produced, in 1907-8, 13,800,000 lb. of dried raisins and currants. The importance of the orchard industry in Australia can be gauged by the value of the production of fruits (other than grapes) for the year 1907-8, when it reached the satisfactory figure of over a million sterling. Apples are the principal fresh fruit exported from the Commonwealth, and the bulk comes from Tasmania. The export from that State to Europe last year numbered about 360,000 cases; this coming season we hope to send between 500,000 and 600,000 cases.

In the northern part of Australia, where, at the present moment, settlement has hardly been commenced, we have a large area suitable for all kinds of tropical agriculture. The Chinese gardeners have already settled this question, for they have grown the very finest pineapples. The pawpaw apple grows luxuriantly in all

parts, and equally well flourish limes, oranges, the mangosteen, cocoa-nut, banana, passion fruit, and mulberries. When this northern territory is developed and connected by rail with the settled parts of Australia, and the magnificent harbour at Port Darwin more generally used, the fruit-production of Australia will attain dimensions which will far exceed the present fruit-production of the whole Empire.

United Kingdom.

No figures are obtainable as to the production of fruit in this country. In 1908 there were under fruit-cultivation 172,751 acres of apples, 9,604 acres pears, 11,868 acres cherries, 15,683 acres plums, 28,815 acres strawberries, 9,323 acres raspberries, 26,241 acres currants and gooseberries, and 60,892 acres of other kinds. Of this acreage of 335,177, it appears that 27,433 acres of small fruits were grown in the large fruit orchards, leaving a net acreage of 307,744 under fruit-cultivation. The industry in this country is growing, and the year 1908 shows an increase of 2,826 acres over the preceding twelve months. That it is capable of considerable extension is borne out by the fact that over 4,600,000 cwt. of fruit, valued at over £3,750,000, were imported into the United Kingdom in 1908. These figures do not comprise the total imports of fruit, but only of those kinds which are actually grown here.

The fiscal policy of this country, together with the fact that the railways are privately owned and therefore run on commercial lines, and, further, that cheap water carriage is available for the transport of fruit from the countries competing in the open markets here, offers no prospect of success to the growers of certain classes of fruit in this country, and therefore the increase in production is not likely to be at all great in the class of fruit suitable for long transport by water. I am informed that at the present time apples can be placed in London from countries thousands of miles away at a lower cost than they can be brought by rail from the fruit-growing districts of England to the great consuming and distributing centre at the heart of the Empire—the City of London.

COLONIAL FRUIT SHOWS.

People are often inclined to think that this or that does no good because the good it does is not immediately and transparently visible; but as a rule it would probably be true to say that all great benefits are brought about slowly and are in their progress unobserved.

This has certainly been the case with the export of grapes from South Africa. Some years ago they were shown at one of the R.H.S. shows, and the Secretary wrote a report to the Colony on the excellent *quality* of the fruit, but at the same time pointed out the grave defects in the packing and the desirability of slightly increasing the size of the individual berries.

A box of grapes just arrived from the Cape was sent to the Show on March 8, and the Secretary was desired to report upon it, which he did as follows:—

March 10.

Dear Mr. Chiappini,—The box of grapes you send, and on which I am desired to report, has reached us safely, and not only reached us safely, but in such wonderful condition as to make it seem almost impossible that it can have travelled all the way from the Cape. There was literally hardly a berry dislodged, and absolutely not one crushed or mildewed. The improvement in the packing is simply marvellous, and the simplicity admirable. I notice with pleasure that none of that once horrible cork-dust is used—nothing, in fact, but a bit of tissue paper wrapped round each bunch, and the bunches laid loosely together, flat in the box, in a single layer. It is impossible to praise the packing too highly.

The size of the berries has also greatly improved, and now leaves little to be desired.

The quality of the grapes themselves is very good, though I fancy I miss the slight muscat flavour the smaller-berried branches have in previous years had so pleasantly.

On the whole they are a wonderful success. Congratulating you on the success which is crowning your efforts,

Believe me, faithfully yours,

W. Wilks, *Secretary*.

To Mr. de Chiappini, Trade Commissioner for the Cape of Good Hope.

THE PARK AND GARDENS OF YILDIZ, CONSTANTINOPLE.

By D. S. Fish, F.R.H.S.

Situated between the suburbs of Bechiktache and Ortakeny, Yildiz occupies a magnificent site on the Bosphorus, the panorama seen from the higher parts of the park comprising a wide stretch of the Asiatic coast from Scutari to Tchenguckeny, near Stamboul, the Sea of Marmora and the Princes Islands. In clear weather the distant snowy summit of Mount Olympus can also be seen.

The slopes of Yildiz are so varied that it is doubtful if even the most monotonous form of planting could have taken away their charm. As it is, the arrangement of the park is far from being ineffective, although a much larger variety of trees could certainly have been well employed, while judicious thinning would have resulted in the better development of many of the trees.

Several little lakes are scattered through the park, but as a rule they are too formal in outline, and scarcely agree with their surroundings. The prettiest of these lakes is situated in the lowest part of the park, and being wooded down to the water's edge with forest trees it has a natural appearance.

Considering the nature of the Turkish summer, the scarcity of sub-tropical plants at Yildiz is somewhat remarkable. There is probably less vegetation of this kind at Constantinople than in the London parks! Almost all the trees, shrubs, and other ornamental plants are of kinds which one would expect to find in an English pleasure ground, and consequently the richly wooded slopes of Yildiz have a distinctly northern appearance.

The most conspicuous of the flowering trees are the Horse Chestnut in red, white, and double-flowered varieties, the Judas tree (*Cercis*), with its numerous purple blossoms, and the False Acacia, *Robinia Pseudacacia*, with its varieties, *Decaisneana*, *Bessoniana*, *glutinosa*, *fastigiata*, *rosea*, and *umbraculifera*. All of these trees flower in the spring or in the early summer, and they then form a magnificent feature in the landscape.

The Scots and Aleppo Pine are conspicuous conifers, and there are also several plants of *Pinus macrocarpa* (*Coulteri*), with its extremely large cones. The Lebanon, Atlas, and Indian Cedars occur, but have not as yet grown to any great height. *Cedrus atlantica* and *C. Deodara* are found to withstand drought better than most conifers. The Maidenhair Tree succeeds, as do the ordinary and variegated forms of both the common and Irish Yew. *Taxodium distichum* and *T. sempervirens*, *Cephalotaxis*, *Thujopsis dolobrata*, and various *Cupressus* are also met with.

FIG. 49.—MERASSIM KIOSK, YILDIZ, CONSTANTINOPLE.

Photo: D. S. Fish.

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The tulip tree does well, as do various kinds of oak (*Quercus infectoria*, &c.), elm, lime, maple, poplar, and plane. *Gleditschia triacanthos* and its thornless variety, *Koelreuteria paniculata*, *Pistacia Terebinthus*, brilliant in its autumnal tints, Indian lilac (*Melia Azedarach*), *Trachycarpus excelsa*, Manna Ash (*Fraxinus Ornus*), chestnut (*Castanea*), *Paulownia*, *Catalpa*, and *Albizzia Julibrissin* also occur. The last-named—an Acacia-like tree, with pinkish, fluffy flowers—is a favourite at Constantinople.

Some of the groups of trees have been underplanted with shrubs. Privets were noticed in a withered condition, presumably on account of its being impossible to supply the water that was once given to them. Several conifers were also suffering from drought. Formerly, a good deal of watering was done, but now much of the ground remains in a parched condition during the summer months.

The following shrubs, &c., are numerously represented: Lilacs, *Euonymus*, Sweet Bay, Spiræas, Aucubas, *Photinia glabra*, Guelder Roses, Laurustinus, *Kerria*, *Berberis dulcis*, *Philadelphus*, *Jasminum nudiflorum* and *J. fruticans*, *Phillyrea*, Deutzias, Weeping Mulberry, *Pittosporum*, *Prunus Pissardi*, Banksian, Chinese, and other free-growing roses. The best variegated-leaved tree or shrub is *Acer Negundo variegata*. It remains in a good condition throughout the summer months.

A considerable amount of "bedding out" was done when the ex-Sultan, Abdul Hamid, was at Yildiz. The principal plants used during the winter were various varieties of Stock, *Eschscholzia*, *Calendula*, Candytuft, Pansy, Daisy, *Mimulus*, *Myosotis*, *Silene*, and Virginian Stock.

In the summer the favourite bedding plants were: Pelargoniums, *Begonia semperflorens*, *gracilis*, and half-shrubby species, Fuchsias, Lantanas, Acalyphas, *Salvia splendens*, Verbenas, *Impatiens Sultani*, large-flowered Cannas, *Coleus*, variegated-leaved *Ageratum*, Chrysanthemums, and various plants used for carpet bedding.

Yildiz consists of:—

(1) The Grand Park, or *Jardin extérieur*, laid out by Sester during the time of the Sultan Medjid (1839-1861). The principal trees have already been mentioned. There are several buildings in the Grand Park, including the porcelain factory, where formerly forty workmen were employed, and several kiosks.

(2) The harem buildings, separated from the Grand Park by a high wall, thus forming a very secure retreat.

In the harem garden, or *Jardin intérieur*, a winding lake with small pleasure boats is a conspicuous feature. The principal plants are fruit trees and conifers. Among the latter are flourishing specimens of *Sequoia*, *Abies Nordmanniana*, *A. Pinsapo*, *Cedrus Libani* and *C. atlantica*, the Weymouth Pine (*Pinus Strobus*), and *Prumnopitys*. Other trees and shrubs that may be mentioned are *Magnolia grandiflora* and *M. conspicua Soulangeana*, several fine Camellias, *Diospyros Kaki*, narrow-leaved myrtle, cut-leaved beech, *Sophora japonica pendula*,

and *Lagerstroemia*, the most beautiful summer-flowering shrub at Constantinople. Cedars in pots sunk into the ground line each side of the principal walk.

One of the two greenhouses in the harem garden was devoted to the Strawberry Guava (*Psidium Cattleyanum*), fine bushy plants, which fruited with great freedom.

(3) The Merassim Kiosk (fig. 49) built to accommodate the Kaiser on one of his visits to Constantinople, is usually regarded as the most imposing building at Yildiz. Hollies and conifers, interspersed with *Magnolia grandiflora*, are planted at the foot of the walls; a garden with an artificial streamlet overgrown with Purple Loosestrife (*Lythrum*), and crossed by a small ivy-clad bridge, has been laid out in front. A little further away is a winter garden and an orangery. The principal bedding plants used in this garden last summer were Petunias and Salvias. Isolated groups of *Bocconia*, *Eulalia*, and *Acanthus* created a good effect. From the Merassim Kiosk one gets an exceptionally fine view of the Bosphorus and the upland country beyond.

(4) The forcing ground consisted of a range of span-roofed glass-houses 33 metres long, 5 m. broad, and 3 m. high, heated by hot-water, and used principally for forcing grapes and peaches planted out in beds, and peaches, plums, and figs in pots; a house, 45 by 5 by 3 m., for fruit trees in pots, early French beans, and small vegetable marrows (*courgettes coureuses*); ten brick frames, 20 by 2 m., devoted to melons, cucumbers, and okra (*Hibiscus esculentus*); three lean-to pineapple and strawberry pits, heated by fermenting material; three long span-roofed pits for orchids and evergreen decorative plants; a large greenhouse for storing plants during the winter and for propagating; an orangery with 1,500 plants of various kinds of Citrus, and a winter garden containing bananas, &c. Vanilla fruited freely in one of the houses; it had, of course, to be fecundated by hand.

Particulars as to the crops formerly grown at Yildiz have kindly been supplied by M. Henry, late gardener to the ex-Sultan. Many of the plants grown under glass suffered during the revolution, as it was impossible to obtain a sufficient quantity of fuel for the furnaces.

(5) The houses of the princes, each with a separate garden.

(6) Separate buildings devoted to the various trades carried on in the Palace grounds: printing, clock, gun, and cabinet making, glazing, besides a foundry and workshops for the locksmiths, joiners, and repairers. There was also a library and the offices for the chamberlains, secretaries, and bodyguard.

The number of gardeners employed during the reign of the ex-Sultan, Abdul Hamid, was 250 for Yildiz and 450 for the whole of the Imperial gardens. The gardeners consisted of nearly equal numbers of Albanians and Turks—the latter from those provinces of Asia Minor which border the Black Sea.

The gardeners were paid at irregular periods at the rate of 27*s*. a month, the foreman receiving 54*s*. to 90*s*. Each workman was supplied with a sufficient quantity of bread, lamp oil, firewood, and also

5 kilos of mutton, rice, and haricot beans every month, besides two suits, a pair of boots, and a fez once a year. The unmarried men lived in bothies, and prepared their food in a common kitchen, the cooking utensils—all in copper—being provided and maintained by the State. Each gardener was entitled to three months' holiday (in exceptional cases six months was given) every three years, in addition to Fridays and fête days.

The work was supervised by a head gardener, who received £38 7*s.* monthly, together with a house allowance, food, clothing, and two horses for his personal use. There were three assistant gardeners; each received from £17 to £31 10*s.*

Since the Government took over Yildiz, the scale of payment has been reduced, 54*s.* being now paid to ordinary workmen, 90*s.* to foremen, while £13 10*s.* has been suggested as a suitable wage for a head gardener.

POLYPODIUM VULGARE AND ITS VARIETIES, WITH A METHOD OF CULTIVATION.

By the Rev. H. Kingsmill Moore, D.D., F.R.H.S.

An enforced rest necessitating the spending of much time in the open air turned my thoughts to the study of natural objects. Though I knew nothing about our native ferns, the rich luxuriance with which they grew about my home in the County Cork had always attracted me, and I decided to make them my study. My plan was to search them out in their native haunts, to note their differences of form, and to cultivate them under conditions as like those of nature as possible. Being debarred from books and having no neighbouring fern-lovers to consult, I had to begin from the beginning and set to work as it were at first hand. This course had manifest disadvantages. Ferns differ greatly at different periods of growth. If you have not realized that many a fern which stands high in the wood or by the stream in summer is little more than a circular series of brown coils in winter, it will take you some time to trace the life-history of your discoveries, and you will be disappointed again and again when something thought to be different from what you have found before turns out to be only a familiar form at a different period of life. On the other hand, there are solid compensations. The knowledge gained, somewhat laboriously perhaps, is apt to be thorough and to abide, while the demands made for careful personal observation introduce to many aspects of the subject which otherwise might easily be overlooked.

Polypodium vulgare abounds in the County Cork. It confronted me everywhere: sometimes a dwarf, sometimes a giant; sometimes in full sun, sometimes in deep shade; sometimes on the ground, sometimes on walls, sometimes on trees. I was able to note the varying conditions under which the fern grew, but drew no deductions.

At that time I was chiefly interested in acquiring good specimens, and I remember rejoicing greatly in a strain of the variety *hibernicum*, whose equal I have never since been able to procure. Later, however, the opportunity came of again growing ferns, with the result that a representative collection was quickly got together and placed in carefully prepared quarters, with due attention to the requirements of each species as usually described.

The Polypodiums were again in favour, and all the available species and varieties, together with some personal "finds," were included. Most of them seemed to enjoy the treatment they received. This was especially the case with the different forms of *P. vulgare cambricum*. This type multiplied in high situations, exposed to all winds, and in

FIG. 50.—GENERAL VIEW OF THE FERNERY.

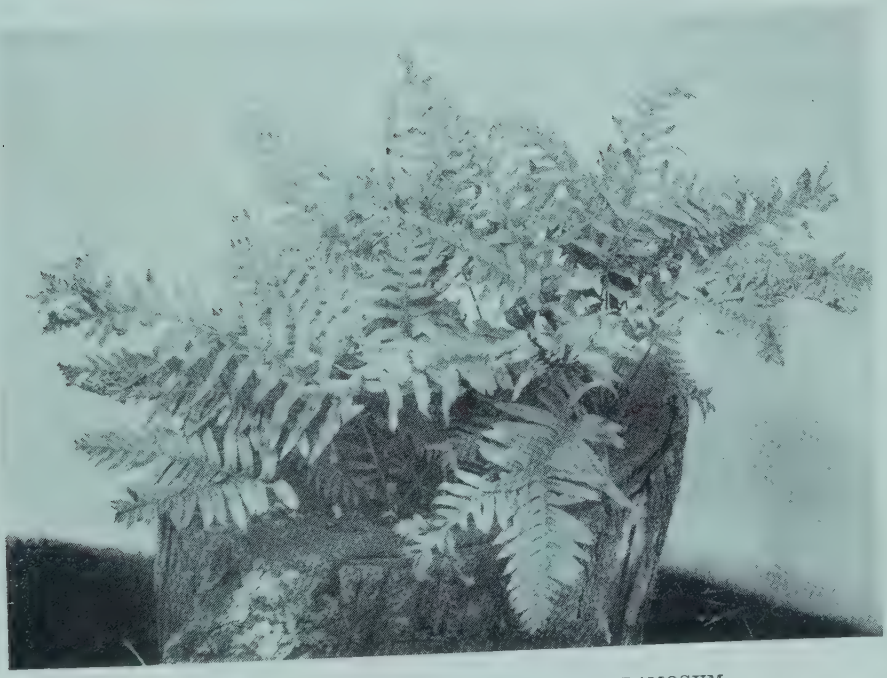

FIG. 51.—POLYPODIUM VULGARE VAR. RAMOSUM.

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FIG. 52.—POLYPODIUM VULGARE VAR. MULTIFIDO-ELEGANTISSIMUM.

FIG. 53.—POLYPODIUM VULGARE VAR. PULCHERRIMUM.
The smaller frond grown in usual way, the larger in wood.

full sun for some hours daily during the summer months. It has a wonderful power of enduring drought. But while the others flourished *P. v. cornubiense* only existed, and its most perfect development *P. v. cornubiense trichomanoides* could scarcely be kept alive. Many devices were tried—differing sites, exposures, and composts—but results were disappointing. Some good pans were obtained under glass, but out of doors little progress was made.

At this stage it happened that the trunk of a Portugal laurel with a central hollow was introduced into the fernery, and an attempt to establish a *cornubiense* in the hollow was made. It seemed a desperate venture, considering how the fern had treated the many and varied allurements with which I had already wooed it. Nevertheless I determined to make the attempt as an experiment. Accordingly a compost of rich leaf mould with a plentiful addition of lime rubble and sand was prepared. The liking of the fern on the one hand for the top of a wall, on the other for a low situation where leaves fall thick, pointed to the kind of soil which it enjoyed. I selected a plant of *P. v. cornubiense* and one of *P. v. multifido-elegantissimum*, *i.e.* a crested *cornubiense*, and placed them in the hollow, keeping the compost in position by means of sods of turf made firm by wire. The specimens were healthy, but their fronds were small. Under no circumstances that I am aware of does *P. vulgare* move quickly after disturbance. I was therefore not surprised at the passing of some months with nothing to note except that the ferns did not seem likely to die. When, however, in the following summer the next set of fronds appeared it was manifest that a change for the better had taken place. Not only had the root stocks spread more rapidly than before, but the new fronds were bolder and better developed than any I had hitherto grown, and the improvement continued. In the meantime, encouraged by the success of the experiment of growing in wood, I made use of other tree stumps for the same purpose.

The fernery is sheltered by high walls on the south-east and south-west; on the north-west, the point from which our worst winds come, there are thick shrubs. A large elm was cut into lengths, some of which were hollow in the centre, and others were easily scooped out to a sufficient depth, while one or two were sound, and had to be cut out with an axe. The hollow lengths were filled with stones to within a few inches of the top. On the stones tough peat sods were laid with the upper side down. The shallow hollow which remained was filled with a compost of leaf mould, say four parts, and of lime rubble and sand, say half a part of each. The lengths which showed decay were considered capable of letting the water drain downward through the wood; all that was done was to lay crocks in the hollow with moss on top of them, and over this a similar compost. The sound lengths were carefully and somewhat laboriously drained by auger holes, after which they were treated like those that were decaying. The stumps were arranged in December 1905, and the planting was done during the winter (fig. 50).

From the first all went well, though the birds soon began to take dust baths in the compost, a trick which had to be combated by wire cages placed over the ferns. The figures will give some idea of how the plants delight in this method of cultivation. The pieces planted in January 1906 would have fitted easily into a four-inch pot.

Figure 51 represents the stump shown at the right of fig. 50. The fern is *P. v. ramosum*. Grown in any other way this variety has proved almost as difficult as *cornubiense*. All it did in the open was to keep alive, and send up annually a few poor fronds. What it is doing now the figure shows. The stump is one of those which showed signs of decay at the time of planting. Fig. 52 represents the stump just behind. The fern is *P. v. multifido-elegantissimum*. The average length of the frond is fifteen inches. Fig. 53 represents two fronds of *P. v. pulcherrimum*. It is an easy variety to manage, but in the wood it seems to be about twice as good as elsewhere. The smaller frond is about as good a specimen as I have seen grown in the ordinary way, except under glass. The larger is taken from the group growing in the fernery. I am disposed to think that for the growth of Polypodiums out of doors the method of cultivation described in this paper is as much before the usual system as the larger of these two fronds is better than the smaller.*

* The figures are from photographs by Mr. T. C. Kingsmill Moore.

THE ORIGIN AND HISTORY OF OUR GARDEN VEGETABLES AND THEIR DIETETIC VALUES.

By Rev. Professor G. Henslow, M.A., F.L.S., V.M.H.

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I.—ROOTS AND TUBERS.

The Chinese Artichoke.

Stachys Sieboldii has nothing to do with artichokes of any sort. It belongs to the Labiate family, and has six allies or species of the same genus wild in Great Britain. The present species occurs wild, and is cultivated in North China, its native name being *Tsanyungtzu*, while in Japan it is called *Chorogi*. It was introduced as a culinary vegetable by the late Dr. M. T. Masters, F.R.S., in 1888.

The dietetic value‡ resides especially in a carbonaceous substance, which reaches 16·6 per cent.; the albuminoids, 1·5; amides, 1·7; and water, 78·3 per cent.

Jerusalem Artichoke.

"The early history of *Helianthus tuberosus* may be regarded under three divisions—a traditional, an early botanical, and a medieval and modern. Of these the traditional resolves itself into the fact of its having been cultivated as an article of food by the Indians of North

* These are illustrated.

† See R.H.S. Journ. vol. xxxiv. p. 15.

‡ The dietetic values are taken from Professor Sir A. H. Church's book on "Foods." The *nitrogenous* ingredients (albuminoids and amides) are the only ones which make brain, muscle, nerves, bones, etc.; the *carbonaceous*, *e.g.* sugars, starch, and oils, contain no nitrogen, but supply energy and heat and make fat.

America before the settlement in that country of Europeans. The earliest evidence of this cited by Mr. Trumbull is that derived from Champlain, who, in 1605-06, observed that the Almonchiquois Indians (of New England) had 'force des racines qu'ils cultivent, lesquelles ont le goût d'Artichaut.' To this Mr. Trumbull adds that it is to these roots that Lescarbot alludes ('Hist. de la Nouv. France,' 1612), when, speaking of the same Indians and their country, he says that the latter contains a kind of roots, 'grosses comme naveaux, très excellent à manger, ayant un goût retirant aux cardes, mais plus agréable, lesquelles plantées multiplient en telle façon que c'est merveille.' Following these is Sagard Theodat, who, in his 'Histoire des Canada' (1636), mentions the roots which the French called 'Canadiennes, or Pommes de Canada.'

"Proceeding now to the medieval history, or that of the cultivation of this plant in Europe, it seems to have been introduced into England very shortly after, if not before, it had attracted the attention of travellers as being propagated by the Indians in America as a food product, for in the year 1617 Mr. John Goodyer, of Maple Durham, Hampshire, received two small roots of it from Mr. Franqueville, of London, which, being planted, enabled him before 1621 'to store Hampshire.' In October of the same year Mr. Goodyer wrote an account of it for T. Johnson, who printed it in his edition of Gerard's 'Herball,' which appeared in 1636, where it is called *Jerusalem Artichoke*. Previous to which, in 1629, it had been figured and described under that name by Parkinson in his 'Paradisus,' and he also mentions it in his 'Theatrum' in 1640.

"From the last-given date to the present time the Jerusalem Artichoke has been extensively cultivated in Europe, but rather as a garden vegetable than a field crop, and has extended into India, where it is making its way amongst the natives under Hindoo, Bengali, and other native names.

"It is very curious that the native country of a plant so well known in gardens, and in a wild state throughout the length of the Central United States, and in Canada, should have for upwards of two hundred and fifty years been considered doubtful. In 1855 Asa Gray's attention was drawn to the subject from having received some long, narrow tubers, which he considered to be *Helianthus doronicoides*, Lamk., with the statement that it had been found to be good food for hogs. These were planted in the Cambridge (U.S.) Botanical Gardens, and were found to produce after two or three years, thicker and shorter tubers, which, when cooked, resembled Jerusalem Artichokes in flavour, though coarser. This led Dr. Gray to conclude that *H. doronicoides* was most probably the original of *H. tuberosus*, an opinion which was strengthened by subsequent observations published in the second edition of his 'Manual of the Botany of the N. United States' (1865). Matters, however, did not end here, for it was discovered that the *H. doronicoides*, Lamk., as described by American botanists, included two species, that so called, and the true

H. tuberosus, Linn., and it was not till the publication in 1884 of the Order of the Compositæ in Gray's 'Synoptical Flora of N. America' that *H. tuberosus*, Linn., was definitely restored to its rank as a substantive species, and the origin of the Jerusalem Artichoke. I may add that *H. doronicoides* differs from *tuberosus* in the leaves being all, or nearly all, opposite, sessile, elliptic, never cordate, obscurely crenate, the rays much broader, and the ovary and achene glabrous.

"It remains to add that *H. tuberosus* is indigenous in the lake region of Canada as far west as the Saskatchewan, and from thence southward to Arkansas and the middle parts of Georgia." *

The tubers, instead of containing starch, like the potato, have an allied substance *inulin*. The chief ingredients are: Water, 80 per cent.; albuminoids, 2 per cent.; gum (known as *levulin*), 9·1 per cent.; sugar, 4·2 per cent.; inulin, 1·1 per cent. The nutrient ratio is 1·8, the nutrient value being 16.†

This plant does not often blossom in England, but I have a specimen in flower from Hitcham, Suffolk, about the middle of the last century. It flowers regularly near Cape Town.

Beet.

It is generally conceded that beetroot is the cultivated form of the maritime species, *Beta maritima*, L., or a variety of *Beta vulgaris*, L., as well as probably the species itself, under which Linnæus groups the red, yellow, and pale green sorts. He considers the white or pale beet *Beta Cicla*, L. The wild slender-rooted plant grows along the coasts of the Mediterranean to Persia and Babylon, as well as in West India. It is also wild round the coasts of England and from Denmark southwards.

The ancient Greek name was *Teutlon*, and the Latin *Beta*. Pliny says the Greeks distinguished two sorts, the black and white, referring to the dark and pale foliage, as they did not eat the root. "Beet is mostly eaten with lentils and beans; it is prepared also in the same way as cabbage, with mustard more particularly." He adds that "when wine in the vat has been deteriorated by assuming a flavour like that of cabbage, its original flavour is restored, it is said, by plunging beet leaves into it."

In the Middle Ages beet is often mentioned under the names *Beta*, *Bleta*, *Sicla*, *Atriplex agrestis* and *A. domestica*; in French, *Arache blanc*. The juice of the black beet was used on the temples for headache.

Dodoens (1559) figures the white and black beets, adding a third figure, "another kind of black beet," for the sake of the root, which is "thick and large, like the rape, the taste being between that of the turnip and parsnip. It is eaten with vinegar, pepper, oil and salt."

That the beetroot was still little known in 1578 appears from

* Sir J. D. Hooker, in *Bot. Mag.* July 1897. See also *Notes on the History of Helianthus tuberosus*, by J. H. Trumbull and A. Grayz (*Am. Jour. Sci. and Arts*, 3rd Dec., vol. xix. 1877).

† The "nutrient ratio" is the proportion of *nitrogenous* to *carbonaceous* ingredients. The "nutrient value" is their sum.

Dodoens' "History of Plants," for he thus writes: "There be two sorts of Beetes, the white and the red, and of the red sort there are two kinds, the one having leaves and root like to the White Beete; the other hath a great thicke roote, and is a stranger among us. . . . It is very well like to a Rape or Turnep, but very red within and sweeter in taste than any of the other two sorts. . . . The roote of the Romane or strange red Beete is boyled and eaten with oyle and vinegar before other meates, and sometimes with pepper, as they vse the common parsenep."

Lobel (1576) also distinguished the turnip-rooted as another kind besides the white- and black-leaved sorts. He describes the root as "within and without wholly red, suffused with bloody gore, sweeter to the taste." Lobel gives the following names:—White Betis (English); Weissert Mangolt (German); Redde Betis (English); Rote Mangolt (German); Roode Beete (Belgium).

Gerard (1597) says he received from Master Lete, a merchant, "from beyonde the seas a bete with leaves very great and red of colour, as well as the roote, full of a perfect purple juice tending to rednesse; the middle ribbe of which leaves are for the most part verie broad and thicke. It grew with me 1596 to the height of viii cubites, and did bring foorth his rough and vneeuen seede very plentifully; with which plant nature doth seeme to plaie and sport hirselfe; for the seedes taken from that plant which was altogither of one colour and sowen, doth bring foorth plants of many and variable colours. This great and beautifull Beete may be vsed in winter for a sallade herbe with vinegar, oile and salt, and is not only pleasant to the taste, but also delightfull to the eie."

That the root was not generally eaten as well as the foliage appears from the following from Gerard's "Herball" (1597): "What might be made of the red and beautifull roote (which is to be preferred before the leaves, as well in beautie as in goodnesse), I referre vnto the curious and cunning cooke, who no doûbt when he hath had the view therof, and is assured that it is both good and holsome, will make thereof many and divers dishes both faire and good" (see *Chard*).

Of modern varieties in cultivation, one is the White or Sicilian Beet, *B. Cicla*, L. It is a native of Sicily, Spain, and Portugal, and was introduced in 1570. The large White or Swiss Chard Beet, a variety of the last, is peculiar for its thick ribs. It is stewed like sea-kale or asparagus.

Professor James Buckman regarded both the garden beet and mangold wurzel as derived from the maritime variety—*B. maritima*, L. The various colours intensified in cultivated, ornamental forms may be detected in the wild plants. The sugar beet is also a selected form of the ordinary red-rooted beet.

Wild beet is a perennial (fig. 54), but both it and mangold wurzel have become biennials by cultivation. Mr. D. Macdonald tells us in his "Some Farm Crops" that beet "does not appear to have been brought into general use as an agricultural crop in England until the end of the eighteenth century," being introduced from Germany as

mangold, and first raised from seed by Dr. Lettsom in 1786. Mr. L. Phillips, an experimentalist at Vauxhall, received a gold medal from the Society for the Encouragement of Arts "for his successful exertions in extending the culture of the variety of beet known as mangold wurzel, &c." Numerous varieties appeared subsequently. The three principal varieties now grown as the garden and sugar beets and the mangold wurzel are all very wholesome on account of the sugar which they contain. Dr. Lyon Playfair suggested that a good brown bread could be made by rasping down beet-roots with an equal quantity of flour, observing that the average quality of flour contains about 12 per

FIG. 54.—WILD BEET (perennial). Quarter natural size.

cent. of nitrogenous matter and the average quality of beet only 2 per cent. The garden beet and the variety of sugar beet of France are about equal in value in sugar, containing 10 per cent., the water in the root being upwards of 82 per cent. Some sugar beets, however, contain a much higher percentage of sugar. The albuminoids or nitrogenous matters being only 0·4 per cent., the nutrient ratio is 1 : 29, the nutrient value 12.

CARROT.

This is a native wild plant, *Daucus Carota*, L., of botanists, and common everywhere. It is known as "Bird's nests" in the country from the peculiar way in which the umbel bearing the fruit curls inwards into a cup-like form (fig. 55).

The carrot and parsnip, as well as the skirret, are not easily distinguished in the writings of the ancients. The Greeks had three words—*Sisaron*, first occurring in the writings of Epicharmus, a comic poet (500 B.C.); *Staphylinos* is used by Hippocrates (430 B.C.); and *Elaphoboscum* by Dioscorides (1st century A.D.). The Latin writer, Pliny (1st century A.D.), has the words *Pastinaca*, *Daucus*, and *Sicer* or *Siserum*. He thus writes: "There is one kind of wild *pastinaca*, which grows spontaneously; by the Greeks it is known as *staphylinos*. Another kind is grown either from the root transplanted, or else from seed, the ground being dug to a very considerable depth for the

FIG. 55.—WILD CARROT (annual). Quarter natural size.

purpose. It begins to be fit for eating at the end of the year, but it is still better at the end of two; even then, however, it preserves its strong pungent flavour, which it is found impossible to get rid of." In speaking of the supposed medicinal virtues, he adds, "the cultivated has the same as the wild kind, though the latter is more powerful, especially when growing in stony places."

Turning to Matthiolus' "Commentary on Dioscorides" (16th century A.D.), under *Staphylinos* he figures three plants—*Pastinaca domestica* (our parsnip), *P. sylvestris* (the wild carrot, *Daucus Carota*, L.), and *Carota* (the cultivated carrot). This word is found first in the writings of Athenæus (200 A.D.), and in a book on Cookery by Apicius Cœlius (230 A.D.).

With regard to the word *Elaphoboscum* used by both Dioscorides and Pliny, it means "stag's food," for it was supposed to be eaten by them as an antidote to snake-bites. It is difficult to determine what Pliny meant by it, but he compared the foliage to that of *Olusatrum*, our "Alexanders," which somewhat resembles that of the parsnip; moreover, the supposed medicinal virtues were more or less like those of the parsnip. Dioscorides says the root is "white, sweet, and edible." Matthiolus, in his Commentary on Dioscorides, figures it as the wild parsnip, called *Pastinaca erratica*. It was called "Baucia" by the herbalists of the sixteenth century.

There are several vocabularies of plants recorded in the Middle Ages,* in which the plants under consideration occur. Thus, *Pastinaca* was called "Feldmora," and *Cariota* was "Waldmora" in the tenth century. These Anglo-Saxon words mean "plain or field root." In the fourteenth century *Daucus* referred to the *D. creticus*, but it was also a synonym for *Pastinaca*, "Anglice, skirwhite" (15th century). W. Turner, in his book called "The Names of Herbes" (1548), thus writes: "*Pastinaca* is called in Greek *Staphilinos*, in englishe a Carot, in duche, pasteney, in frenche, cariottes. Carettes growe in al countries in plentie."

Under the name *Sisaron*, he writes, "*Sisaron* siue *siser*, is called in Englishe a Persnepe. . . . Fuchsius rekoneth that our skyrwort or skywrit is a kind of siser. Persenepes and skirwortes are commune in Englande."

Daucus he regards as "*Pastinaca sylvestris*, in english wild carot."

With regard to *Daucus*, it occurs as *Daucos* (Greek) in Theophrastus (4th century B.C.) and *Daucus* in Pliny. Both he and Dioscorides refer to a medicinal plant in Crete, but not the true carrot. Theophrastus, however, has *D. niger*, which has been recognized as the carrot by sixteenth-century writers, and known to herbalists as *D. officinarum* or *Carotta*. Several writers identify it as having white flowers with a central purple one in the umbel, as is almost always the case, while the flowers of the parsnip are yellow.

Dodoens, in his "History of Plants," consisting of plates (1559), figures *Staphylinus sylvestris*, the wild carrot, *Elaphoboscum* and *E. sylvestre* as the wild parsnip, called Baucia or skirwit in the shops.

By the end of the sixteenth century these plants became quite distinct, for Gerard, in his "Herball" (1597), describes them as *Pastinaca latifolia, sativa, et sylvestris*, the garden and wild parsnip. *Pastinaca tenuifolia, sativa et sylvestris*, the yellow carrot, cultivated and wild.

It appears to have been the physician Galen (2nd century A.D.) who added the name *Daucus* to distinguish the carrot, *Daucus Pastinaca*. Hence *Daucus* came to be the officinal name of herbalists in the sixteenth century, and finally was adopted with *Carota* by Linnæus in the eighteenth century, by which name it is now known. As stated above, the word *Carota* appears to have been first used by Apicius Cœlius, a writer on cookery, about 230 A.D.

* *English Plant Names*, by T. Earle.

Experiments have been made by M. Vilmorin in 1832, M. Languet de Sivry in 1840, and Professor Jas. Buckman in 1848, proving that the culinary carrot is easily obtainable from the wild species by cultivation and selection. The following was the procedure: In 1833 M. Vilmorin noticed that some seedlings were later than others in coming into blossom. He saved seed from these in 1834 (all having been annuals) and sowed them in 1835. A large proportion now yielded thick roots. He continued the process of selecting from the *best roots* and *latest in flowering*, till at least nine-tenths were satisfactory carrots. They varied in colour from yellow, lilac, to red. He thus converted a wild annual into a biennial, the advantage being that the foliage had a much longer time for developing starch and sugar, while the root responded in growing so as to store it up.*

M. Languet de Sivry, in 1846, observed that seeds of short-rooted carrots, when sown in a particular soil, in the alluvial deposits formed by a small river in France, yielded immediately, during the first generation, a number of long-rooted plants, either white or yellow, whose roots were very much larger than those of the parent plants. The seeds of the best were selected and sown in the same soil. The result was that in the second generation hardly any roots were found of the short type.† The quality of the different soils is not mentioned, but the one in which the long-rooted forms appeared, being *alluvial*, shows that it was a *light* soil. We shall see that similar results occurred with rape and turnip, as well as with the radish.

With regard to the nutriment in carrots, they contain 89 per cent. of water, 0·5 of albuminoids, 4·5 of sugar, and 1·0 per cent. of mineral matter, the nutrient ratio being 1 : 14, and the nutrient value 7·5.

Chervil.

Though chiefly used for its foliage, the root of chervil is also eaten, boiled. It was known to the ancients as *Scandix* as a wild plant and *Anthriscum* seems to have been the cultivated form, according to Pliny, who only alludes to them for their medicinal virtues. He adds that it was "this plant that furnished Aristophanes with his joke against the poet Euripides, that his mother [said to have been a greengrocer] used to sell, not real vegetables, but only *scandix*!"

At the present day the botanical name is *Chaerophyllum sativum*, Bank., or *Anthriscus Cerefolium*, though Linnæus named it *Scandix Cerefolium*. It appears to be indigenous in the south-east of Russia and west temperate Asia.

Besides the preceding, the Parsnip Chervil, *A. bulbosus*, is also cultivated for its roots as a vegetable. Chervil was cultivated by Gerard in Holborn in 1590. The leaves impart an aromatic flavour

* *Notice sur l'Amélioration de la Carotte Sauvage* in *Notices sur l'Amélioration de Plantes par la Culture*. Paris. 1886. See also *Trans. Hort. Soc.*, 1840. 2nd Series, vol. ii., p. 348.

† Cf. *Société Royale et Centrale d'Agriculture*, 2nd Series, vol. ii., 1846-7, p. 539. The above is quoted from H. de Varigny's *Experimental Evolution*, p. 205.

to soups and stews. They are also eaten like mustard and cress on the Continent. The parsnip chervil is a native of France, and was introduced into England in 1726. The root is white within, and the flavour is said to be between those of the chestnut and potato.

Horse-radish.

Though the edible part of this is sometimes regarded as the "root-stock" or the base of the stem, it is really the ascending root-branches which bear a bud at the top; and was so figured by Lobel in the sixteenth century. The Greek name was *Raphanos agrios*, and in Latin, *Raphanus sylvestris* or *Armoracia*. Hence, Linnæus called it *Cochlearia Armoracia*. Gerard (1597), under the name *Raphanus rusticanus*, says it occurred wild in several places in England; but Sir J. D. Hooker says that the origin is unknown, being "possibly a cultivated form of *C. macrocarpa*, a native of Hungary." Gerard mentions this plant as an illustration of the old idea of "Antipathies." He says "Diuers thinke that this Horse Radish is an enimie to Vines, and that the hatred between them is so great, that if the rootes heereof be planted neere to the vine it bendeth backward from it as not willing to haue fellowship with it."

The horse-radish in the sixteenth century was regarded as a medicinal plant, but does not appear to have been used in any other way in England, for Gerard says: "The Horse Radish stamped with a little vinegar put thereto is commonly vsed among the Germanes for sauce to eate fish with, and such like meates, as we do mustarde." It thus passed from a drug to a condiment.

Parkinson, writing in 1640, also says it was used as above "with country people, and strong labouring men in some countries of Germany, &c." He then adds, "and in our owne land also, but as I said, it is too strong for tender and gentle stomackes."

Spanish Oyster Plant.

This plant is better known in France, and on the Continent, as *Cardillo*. It belongs to the Compositæ, and is botanically *Scolymus hispanicus*, L. It has a white tap-root and somewhat spiny leaves and bright yellow flowers, being a native of Italy and Sicily. It is described as having great delicacy of flavour. A long account of the best method of cultivation is given in "Bulletin de la Société d'Horticulture de l'Aube," vol. i., p. 217. It is mentioned in some of our seed catalogues, Mr. Dickinson thus describing it: "This excellent vegetable is more productive and better flavoured than salsify. . . . The roots are cooked and served like salsify."

Parsnip.

We have seen that the parsnip has been cultivated from antiquity to the present day;* but Pliny tells us that it was "grown, either from

* See p. 120.

the root transplanted or else from seed; but that it was impossible to get rid of the pungent flavour." It appears, therefore, that the Roman horticulturists knew nothing of the advantages of selecting, as is done at the present day, by means of which the best existing variety was obtained from the wild plant between 1848 and 1850, by selecting the seed from the best-rooted plants of each generation raised from the seed of the wild plant.

This was done by the late Professor James Buckman in the garden of the Royal Agricultural College, Cirencester. He collected the seed from wild plants of the neighbourhood in 1847 (fig. 56). "In 1848 they were sown, and in the spring of 1849 the reserved roots were

FIG. 56.—THE WILD PARSNIP (annual). One-fifth natural size.

dug up and the best put aside for transplanting. Late in the summer of 1849 the seed was collected, and sown in 1850. The result of the second sowing was that the leaves in all indicated an advance to the cultivated form. Some specimens were much finer than others, of good size and tolerably smooth outline"* (fig. 57, A).

Professor Buckman called the best "The Student," and sent the seed to Messrs. Sutton & Sons, of Reading. It was sent out by them, and greatly improved subsequently. It gained many prizes—as one writer observes, "This is the twelfth year in succession we have been awarded first honours for 'Student.'" Another writer says: "I had a fine crop of parsnips from the 'Student,' half a yard long and

* *Journ. of the Royal Agr. Soc. of Eng.* xv. pt. 1, p. 125 (1854).

four or five inches round" (fig. 57, B). The following are some conspicuous differences between the wild parsnip and the "Student":—

The root of a wild plant grown by the roadside in Dorset had a tough, wiry root, tapering somewhat from the crown. The leaves had petioles nine inches long, the leaflets being from one to two inches; the larger one three-quarters of an inch broad, and all pubescent or softly hairy. The sheath at the base of the petiole was one and a half inch long, the first pair of leaflets being four inches above it.

The leaf of the "Student" is two feet long; the first pair of leaflets several inches above the sheath. They are oblong, about two inches

FIG. 57.

A.—Third generation of parsnip from seed of wild plant (1847) cultivated by Professor Buckman. The origin of "The Student" ($\frac{1}{3}$ length).
B.—"The Student" parsnip, twenty-eighth generation (1903) from the wild plant ($\frac{1}{3}$ length and width); still one of the most useful in the trade (1910).

across at the basal part, and four and a half inches in length, and smooth.

There are considerable differences between the above and the leaf of the old type of parsnip grown in the middle of the last century. The sheath of the leaf of this was very large, and reached up to the first pair of leaflets. These are much broader at the base, making them more oval, the lower ones being five inches long, the whole length of the petiole being about sixteen inches. Lastly, the serrations are coarser than those of the "Student," which imitates the wild plant more closely.

As a vegetable in the sixteenth century, Gerard observes: "The Parsneps nourish more than do the Turneps or the Carrots, and the nourishment is somewhat thicker, but not faultie nor bad. . . . There is a good and pleasant foode or bread made of the rootes of Parsneps, as my friend Master Plat hath set foorth in his booke of experiments, which I have made no triall of, nor meane to do."

In 1730 Tournefort tells us that in his day "they are commonly boiled and eaten with butter in the time of *Lent;* for that they are the sweetest, by reason the juice has been concocted during the winter, and are desired at that season especially, both for their agreeable Taste and their wholesomeness. For they are not so good in any respect, till they have been first nipt with Cold. It is likewise pretty common of late to eat them with Salt-Fish mixed with hard-boiled Eggs and Butter . . . and much the wholesomer if you eat it with Mustard."

(To be continued.)

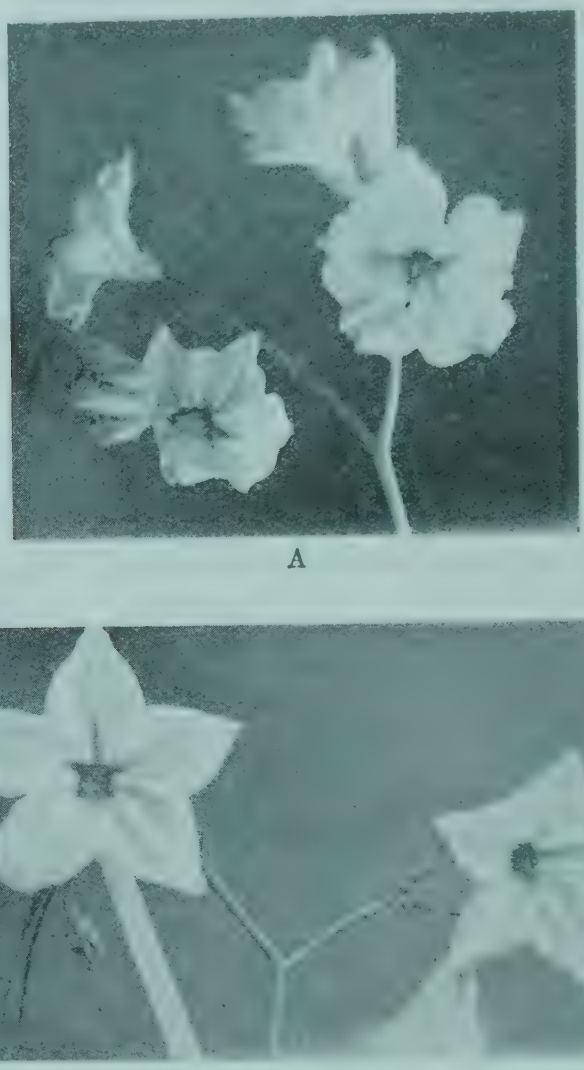
NOTES ON SOME HYBRID TUBEROUS SOLANUMS.

By Rev. J. Aikman Paton, M.A., B.Sc.

In order to get a clear start and to obtain reliable facts as to the unit-characters of the potato and their inheritance, it seems at least desirable to cross plants which are fairly typical members of pure lines of species or varieties having distinct characters. None of the cultivated kinds are of value for this purpose, all of them being already inbred hybrids, as their selfed seedlings conclusively show. In the really wild types, which reproduce themselves true from seed, being homozygotic, we readily find material which answers the requirements. And it would seem that, to ensure success and to check the accuracy of the result, the selected individuals of the two wild types chosen for the experiment should be carefully marked and continued for some years by means of their tubers [as well as by selfed seed] in order (1) to repeat the experiment with the same plants; (2) to make a comparison of the hybrids F_1 with the parental types (both the hybrids and parents being propagated by tubers, and the latter *also* by selfed seed) during subsequent years; (3) to test whether F_2 seedlings are more vigorous than the corresponding parents, or differ from them in any way with respect to given characters; (4) to observe whether selfing the plants arising from tubers gives the same or different results from those originally given by selfing the first-year seedlings. In each year, every character which is similar, and every character which is different in the case of the hybrids and the parent plants, with the relative ratios, should be carefully noted, with photographs to scale, if possible. This I am endeavouring to do. By the use of "pure lines" one is enabled, among other things, to eliminate, or at least to allow for and discount, the element of fluctuating variability, which in the potato is considerable.

Among the pairs of types chosen in 1908 were the white-flowering *Solanum Commersonii* and *S. tuberosum* (wild Mexican form). These were crossed, *S. tuberosum* being the pollen-parent. A great many of the resulting berries were seedless, this being a common result with *S. Commersonii*. The number of berries having seeds obtained by the cross was twelve, containing thirty-three seeds in all. [A number of selfed berries containing fertile seed were also obtained at the same time, but these do not at present enter into this result.] The number of seeds in the berries varied from one to eight; they were very dark in colour, nearly black. The seed was sown on March 19, and of the thirty-three seeds, which were plump and seemingly good, only nine resulted in seedling plants. Two of these were kept in pots in a greenhouse (except for about two months, July and August, when

they were out of doors). The others were planted in the open garden, and remained there till November. All grew and flowered freely, and produced numerous seed berries, nearly all of which contained seed. Curiously, however, one of the earliest and largest berries [on plant No. 2] which I had selfed was seedless. The seeds are being kept and will be carefully sown in March 1910, in the hope that F_2 may show Mendelian segregation. Several berries have also been got by



A

B

FIG. 58.—S. COMMERSONII × S. TUBEROSUM.
A, EARLIER FLOWERS OF TUBEROSUM SHAPE; B, LATER FLOWERS OF COMMERSONII SHAPE.

fertilizing the above hybrids with pollen of *S. tuberosum*, its pollen-parent, and the seed will be sown with a similar object. The original cross *S. Commersonii* × *S. tuberosum* has also been repeated in 1909, in order to compare with and check the previous year's results.

Several of the hybrids were still growing in January (1910) in fair vigour; and in mid-December (1909) they were still flowering, and were selfed and crossed and forming berries which are now ripening.

The description of the hybrids, which is given in the R.H.S. Journal, vol. xxxv. p. ccxxvii., is taken from an average plant [No. 2], but the calyx of the hybrids varies somewhat; in the case of one plant the tip is awl-shaped like that of *S. tuberosum*. A remarkable fact in regard to one of the plants [No. 3] is that its last blooms were *star-shaped*, like those of *S. Commersonii* (*cf.* fig. 58 with fig. 59, B),

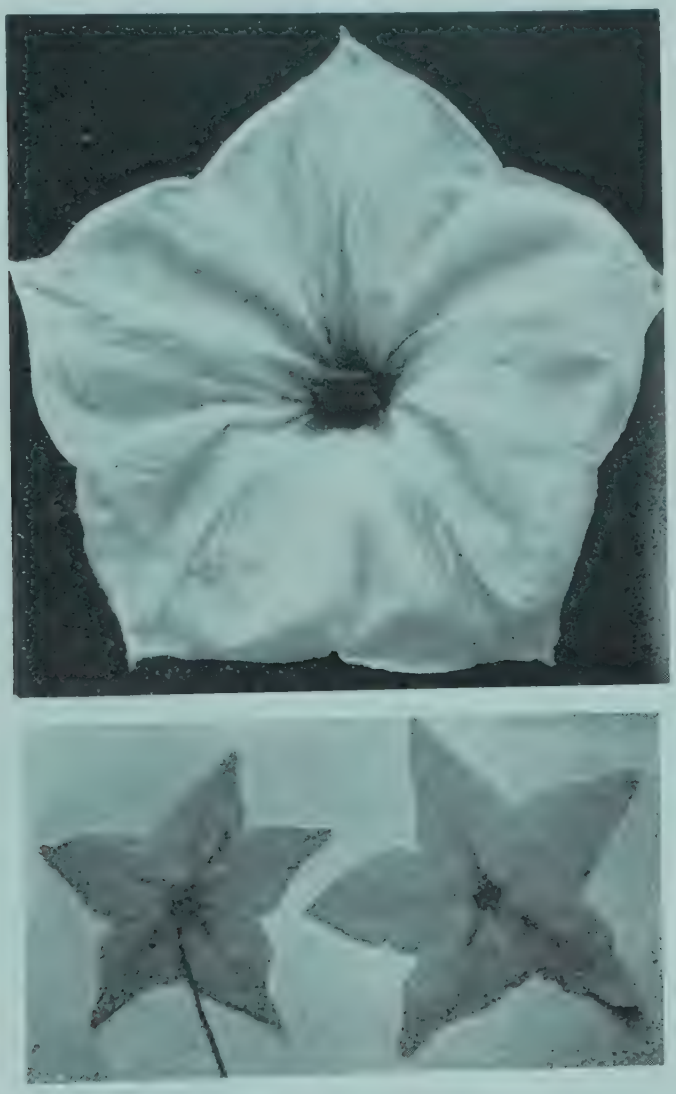


Fig. 59.—A, Flowers of Seedling of Solanum etuberosum; B, of S. Commersonii. (Natural size.)

although all the earlier ones were pentagonal like those of *S. tuberosum*. Before the last blooms were formed the plant had been sent long distances by rail, with insufficient protection, and exposed to frost for a time, so that the flower-buds were probably injured, and this may have caused the loss of the dominant factor for form. The colour remained lilac unchanged.* Photographs of these are shown at fig. 58. Fig. 60 shows the berries of both parents and the hybrid.

* It may be worth recording that upon a plant of *S. tuberosum*, which had a similar transit by rail, the berries on one branch were round, with spots very

The tubers of these hybrids are white and smooth, with some lenticels, and of good shape (fig. 63, A). One plant [No. 3] had seventy-six tubers, and its stolons were much shorter than those of *S. Commersonii*. Although most of the hybrids were growing in the open garden until cut down by frost in November—they stood 5° or 6° F. in October without harm—not the faintest trace of disease due to

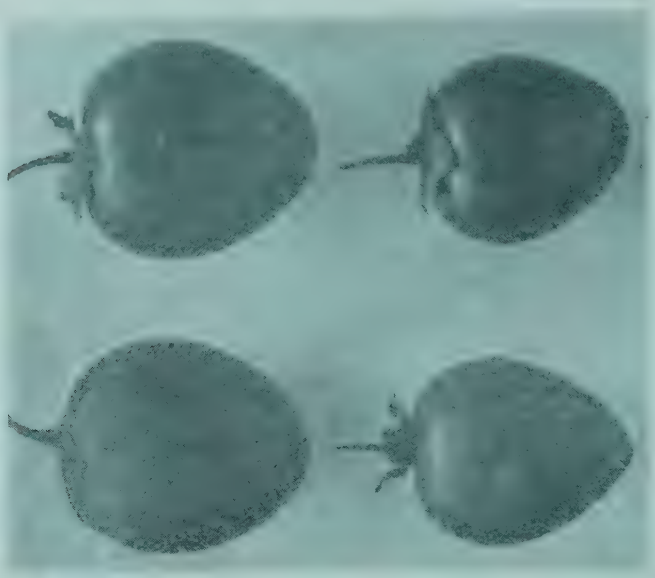


FIG. 61.—BERRIES OF SOLANUM COMMERSONII × S. TUBEROSUM.

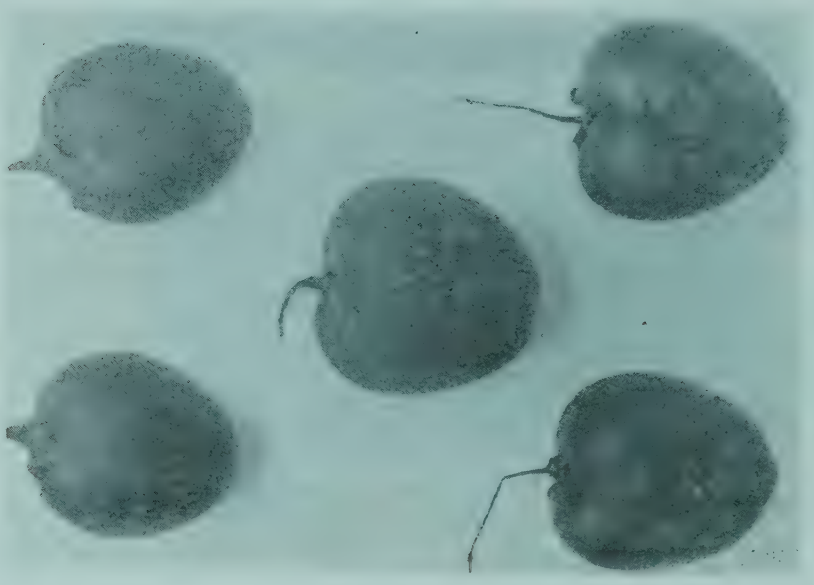


FIG. 60.—A, BERRIES OF SOLANUM TUBEROSUM (MEXICO); B, BERRY OF S. COMMERSONII × S. TUBEROSUM; C, BERRIES OF S. COMMERSONII (WHITE).

Phytophthora infestans was upon a single leaf of any of them, while the haulms of every other sort of Potato growing in the neighbourhood

small and close and scarcely visible, with long pedicels, while those on another branch were pointed at the tip, with fairly large and visible spots and short pedicels. Probably the round berries were formed before the plant was injured and the others after. Unfortunately the plant, which was lifted from the open ground and potted when full grown and in flower, formed no tubers in the pot. The seeds, however, have been kept separate.

(except those of my 'Immune' [1908] strain, now the property of Messrs. Sutton) were completely destroyed by it.

In addition to these, among other hybrids of wild types of Potato obtained, the following may be mentioned for comparison with the work of other experimenters:

1. S. ETUBEROSUM* × S. TUBEROSUM (Mexico). This seedling has a very strong, erect, dark stem (Nos. 192, 193), the upper parts mottled and green, with wavy edges; the foliage like that of *S. tuberosum*; leaflets distant upon rhachis, often with several interspersed pairs; terminal leaflets much the largest, edges of leaflets plain (not wavy, as in *S. tuberosum*). Flower not noted. Berry much elongated, bronze-green, covered all over with pale whitish-green spots. Tubers

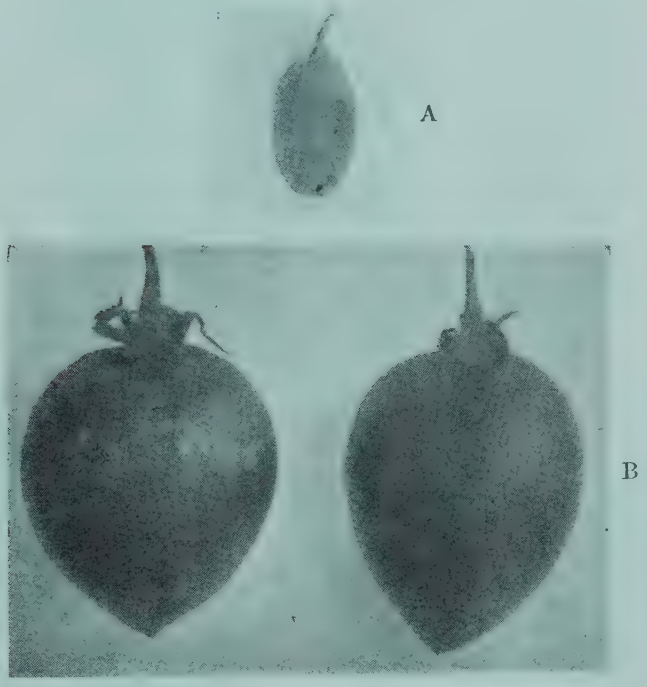


FIG. 62.—A, SMALL BERRY OF SOLANUM ETUBEROSUM × S. TUBEROSUM; B, BERRIES OF SEEDLING OF S. ETUBEROSUM. (Natural size.)

numerous (forty-six, weighing about 4 oz.), round and flattish round (discoidal), mid-violet colour, smooth (fig. 63, B). Four selfed berries formed, containing 7, 9, 16, and 59 seeds respectively (fig. 62, A).

2. S. VERRUCOSUM × S. ETUBEROSUM.* This hybrid has a green stem; foliage as in *S. verrucosum*, but leaflets slightly broader. Flower paler than *S. verrucosum* and *drooping*; style slightly projecting beyond the stamens; calyx large, deltoid-acuminate, not recurved as

* The *Solanum etuberosum* used in these experiments (not *S. etuberosum* Lindl.) is unfortunately a hybrid—presumably a natural hybrid—so that these two crosses are of less value for tracing the inheritance of characters, and I anticipate that many similar natural hybrids may be found, some of them probably possessing qualities like *S. etuberosum* which may lead in the future to entirely new strains of potatos. The immense vigour of some of the seedlings of *S. etuberosum* is well illustrated by the figures, showing a flower of one and berries of another (figs. 59, A, 62, B).

in *S. verrucosum*, hairy; pedicels and calyx dark violet (Nos. 192, 193) [in *S. verrucosum* these are green]. Free-flowering, but not free-seeding. Berry round, with dark violet stripes down the sides (similar to *S. polyadenium*), and pale spots like *S. etuberosum*. Only one berry formed. Tubers white, round, and smooth (fig. 63, c), natural size.

3. S. TUBEROSUM × S. VERRUCOSUM. These hybrids are scarcely distinguishable from the pollen-parent (*S. verrucosum*) in regard to

FIG. 63.—TUBERS OF HYBRID SOLANUMS.
A, Solanum Commersonii (white) × S. tuberosum (No. 2); B, S. etuberosum × S. tuberosum; C, S. verrucosum × S. etuberosum.

habit, foliage, flower, and fruit. They have, however, much greater vigour, most of the plants measuring about 3 feet in height and the same across, and are very floriferous, with sweetly-scented violet flowers (No. 192_2). The calyx is deltoid-acuminate, with awl-like tips, and the berries like those of *S. tuberosum*, but with less distinct paler spots. The stolons are very long (3 to 4 feet) and thick; tubers white on lifting, with a faint violet tinge in parts, which by and by extends all over and deepens to mid-violet; many lenticels; eyes few and shallow. One plant had forty-five tubers, weighing 5 oz.

REPORT ON METEOROLOGICAL OBSERVATIONS AT WISLEY, 1909.

By R. H. Curtis, F.R.Met.Soc.

The meteorological observations have been carried on without a break throughout the year. In March, however, a change was made in the observer, owing to the resignation by Mr. Wallis of his appointment at Wisley. Mr. Wallis had taken the observations for eight years, and was in every way a most excellent observer, keenly interested in his work, and most careful and accurate in his performance of it. He has been succeeded by Mr. Miles, who had the advantage of being trained by Mr. Wallis, and has taken the observations since the beginning of March.

From a meteorological point of view, the year was somewhat exceptional. The summer was decidedly cool, and, indeed, the only warm periods for their respective seasons were the months of April and October. Rainfall was in excess of the average in these months, and there was less than the usual amount of sunshine.

The results for each month were as follows:

January.—The weather of January may be summarized as having been generally mild and unsettled, with a moderate amount of rain during the first three weeks, followed by a dry, cold, and quiet period, during which there was a considerable amount of fog. The wind blew with greatest frequency from the south-west and west, and near the middle of the month it was often rather strong, although it was only at exposed places that it attained the force of a gale. During the earlier part of the month the temperature rose to above 50° in almost all parts of the kingdom, the south-eastern counties forming the chief exception, although at night some low readings were occasionally registered upon the grass; but in the last week sharp frosts were very generally experienced, and the thermometer exposed upon the grass fell to a very low point in many districts. At the Gardens the lowest point reached in the screen four feet above the ground was 19° on the 29th, the thermometer on the grass falling to 18°.5, but in some districts readings of 10° and less were recorded. The mean temperature for the month was not very different from the average. The movements of the barometer at the Gardens covered a range of rather more than an inch and a quarter—from 30·62 in. on the 4th to 29·26 in. on the 15th. There were no heavy falls of rain, and the total amount was considerably below the average, while the amount of bright sunshine recorded was somewhat above the average.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	37°.7
Highest „ „ „	51°.0 on the 14th
Lowest „ „ „	19°.0 „ 29th
Lowest „ on the grass	18°.4 „ 29th
Number of days of ground frost	20

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	38°.6	41°.0	43°.6
Highest „ „ „	42°.2	43°.0	44°.6
Lowest „ „ „	34°.8	37°.6	41°.4

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 89 %

Rain fell on 12 days to the total depth of ... ... 0·84 in.
(Equivalent to about 3·9 gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·19 in. on the 10th

The prevailing winds were from south-west and west.

The average velocity of the wind was 6 miles an hour.

There were 49 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 14 days on which no sunshine was recorded.

February.—The weather during this month was in some respects exceptional, being marked by a very small fall of rain and an unusually large amount of bright sunshine. The bright weather was, however, generally cold, owing to the easterly and northerly winds which prevailed during a large part of the time, and there were but few really warm days, while on several occasions the thermometer in the screen fell considerably below the freezing-point, and once (on the 23rd) a minimum of 17° was registered at the Gardens. On the last three days of the month snow fell over most of the country, but not to a large amount. At Wisley 33 per cent. of the possible amount of sunshine was recorded, but in many parts of the kingdom the amount reached between 40 and 50 per cent.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	36°.6
Highest „ „ „	56°.1 on the 4th
Lowest „ „ „	17°.0 „ 23rd
Lowest „ on the grass	14°.0 „ 23rd
Number of days of ground frost	26

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	36°.2	38°.5	41°.0
Highest „ „ „	43°.4	42°.0	42°.1
Lowest „ „ „	33°.9	36°.5	39°.6

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 87 %

Rain fell on 6 days to the total depth of ... ... 0·33 in.
(Equivalent to about 1½ gallon of water to the square yard.)

Heaviest fall on any day ... ... 0·11 in. on the 28th

The prevailing winds were from between north and east, but there were many from west and south-west.

The average velocity of the wind was 6 miles an hour.

There were 91 hours of bright sunshine, equal to 33 per cent. of the greatest possible amount.

There were only 5 days on which no sunshine was recorded.

March.—The weather of March was very unusual in some respects. The distribution of barometric pressure was almost the exact opposite of the normal, and this caused a continuance of very cold weather, during

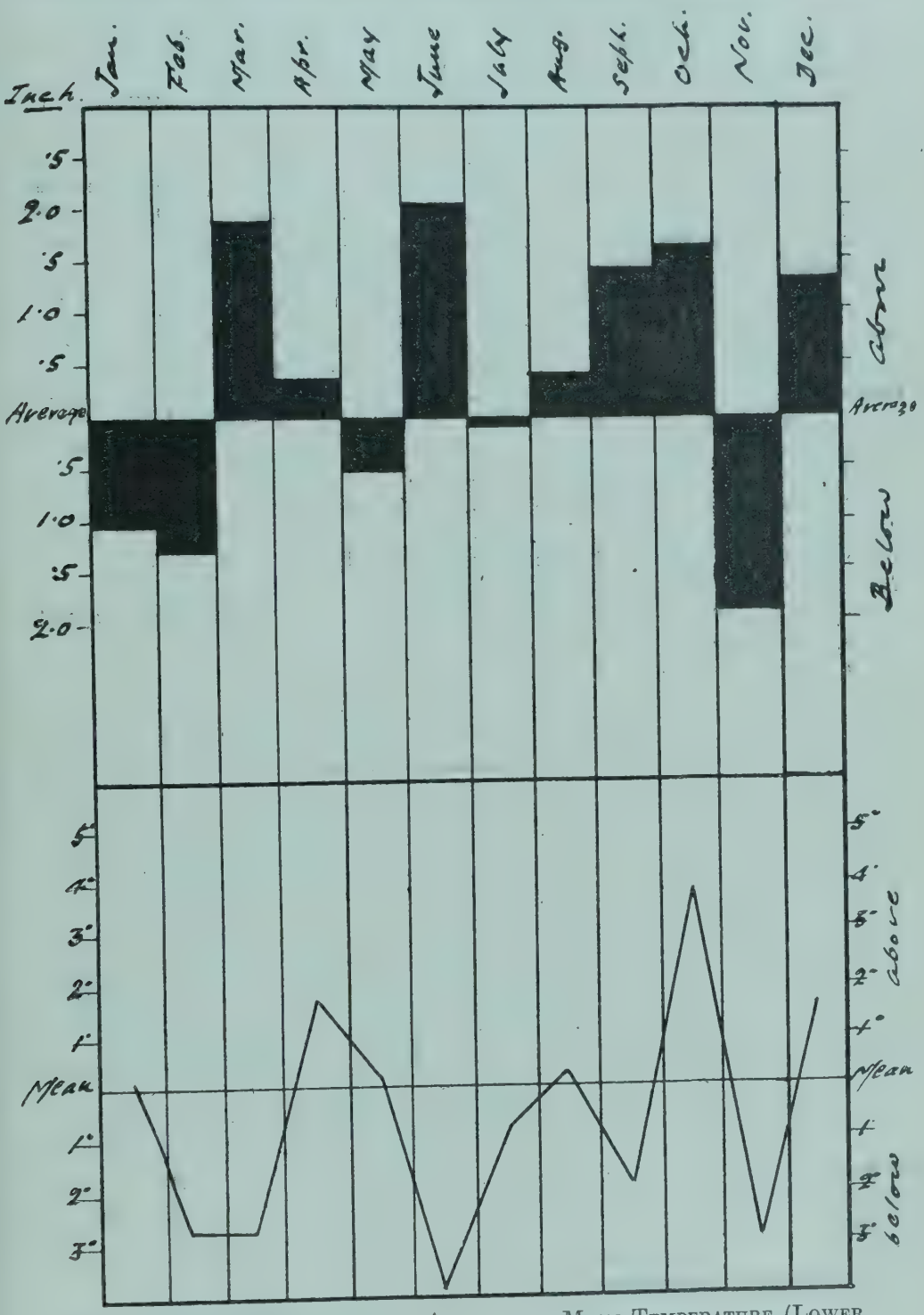


FIG. 64.—DIFFERENCE FROM THE AVERAGE OF MEAN TEMPERATURE (LOWER HALF OF DIAGRAM) AND OF RAINFALL (UPPER HALF) FOR EACH MONTH.

which the temperature frequently fell many degrees below the freezing-point, and at a few places it fell below zero; generally speaking, it was the coldest March experienced for many years. The rainfall also was

abnormal, both in amount and distribution, the fall over Southern England, and along the Eastern Coast right up to the North of Scotland, being double the average, while in the West generally it was below the average, and in the West of Scotland very much so. At Wisley there was rain on twenty-four days, and the amount of bright sunshine registered was only 19 per cent. of the possible amount.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	39°.1		
Highest „ „ „	58°.0 on the 29th		
Lowest „ „ „	14°.0 „ 2nd		
Lowest „ on the grass	11°.0 „ 5th		
Number of days of ground frost	16		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	33°.8	39°.6	40°.3
Highest „ „ „	46°.2	44°.9	43°.1
Lowest „ „ „	34°.2	36°.3	39°.1
Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100)	88 %		
Rain fell on 24 days to the total depth of...	3·31 in.		
(Equivalent to about 15½ gallons of water to the square yard.)			
Heaviest fall on any day	0·90 in. on the 6th		

The prevailing winds were at first northerly and easterly; then southerly.

The average velocity of the wind was not recorded.

There were 69 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

April.—The month opened with a spell of fine weather, and during the first fortnight there was a succession of days of brilliant sunshine and seasonable warmth. Following upon this came some showery weather, but bright sunshine was fairly plentiful right through the month, there being only one day on which none was recorded. Temperature was above the normal, but night frosts were rather frequent and occasionally the thermometer fell to a rather low point, the daily range being in consequence large; over the Eastern Counties the mean temperature was nearly 3° above the average. The rainfall as Wisley was 2 in., but in some districts it did not exceed an inch, although in others—mainly in the West—the total fall was very large. The amount of sunshine at Wisley averaged eight hours per diem.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	48°.4		
Highest „ „ „	71°.0 on the 10th		
Lowest „ „ „	27°.0 „ 2nd		
Lowest „ on the grass	20°.0 „ 7th		
Number of days of ground frost	13		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	47°.0	47°.5	45°.7
Highest „ „ „	51°.9	51°.1	48°.7
Lowest „ „ „	41°.1	43°.6	43°.4
Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100)	74 %		

Rain fell on 13 days to the total depth of ... ... 2·00 in.
(Equivalent to about $9\frac{1}{4}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·62 in. on the 19th
The prevailing winds were from between south and west.
The average velocity of the wind was not recorded.
There were 238 hours of bright sunshine, equal to 58 per cent. of the greatest possible amount.
There was only 1 day on which no sunshine was recorded.

May.—This was a fine month, with a slight rainfall and a very large amount of bright sunshine, causing warm days, which, however, were not infrequently followed by cold nights, so that the range of temperature was large. The temperature soon after the middle of the month rose to upwards of 80° in many parts of England, and throughout the month the thermometer continued fairly high. About the middle of the month the traditional "cold period in May" made its appearance, and lasted three or four days, during which east and north-east winds prevailed, some slight showers of sleet and snow accompanying them in some of the Midland and Northern Counties. The great feature of the weather of the month was, however, the remarkable prevalence of bright sunshine, the record at Wisley averaging ten and a half hours a day and in some parts of the British Isles as much as eleven and a quarter hours a day, being the largest May record since the introduction of the Sunshine Recorder. Rain was measured on nine days, but more than two-thirds of the total fall fell on two days, and there was not one entirely sunless day.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	52°.3		
Highest „ „ „	80°.0 on the 21st		
Lowest „ „ „	32°.0 „ 16th		
Lowest „ on the grass	23°.8 „ 16th		
Number of days of ground frost	14		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	53°.1	53°.1	50°.6
Highest „ „ „	59°.3	57°.5	53°.4
Lowest „ „ „	46°.9	49°.3	48°.5

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 62 %
Rain fell on 9 days to the total depth of ... ... 1·51 in.
(Equivalent to about 7 gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·67 in. on the 24th
The prevailing winds were south-westerly.
The average velocity of the wind was 5 miles an hour.
There were 322 hours of bright sunshine, equal to 68 per cent. of the greatest possible amount.
There was not one day on which no sunshine was recorded.

June.—This was a month of cold, unsettled, inclement weather, and although near the middle of the month there was a slight improvement for a while, yet the temperature never reached the ordinary level for the time of the year, and over the greater part of the country the month proved one of the coldest Junes on record. There was a good deal of rain, especially during the latter half of the month, and in

contrast to the preceding month, when there was a record amount of sunshine, the amount now recorded was exceptionally small, averaging less than four hours a day at Wisley, and still less in some other parts of the kingdom, and generally reaching less than a quarter of the possible amount. The winds were from northerly points as a rule, but generally speaking they were not strong.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	54°.2		
Highest „ „ „	71°.0 on the 19th		
Lowest „ „ „	37°.0 „ 11th		
Lowest „ on the grass	34°.0 „ 11th		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft deep.
Mean temperature of the soil at 9 A.M.	56°.6	56°.8	54°.3
Highest „ „ „	60°.2	58°.8	55°.7
Lowest „ „ „	52°.7	54°.1	53°.1

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 73 %

Rain fell on 21 days to the total depth of ... ... 3·80 in.
(Equivalent to about 17¾ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·65 in. on the 26th

The prevailing winds were from between north-west and north-east.

The average velocity of the wind was 5 miles an hour.

There were 116 hours of bright sunshine, equal to 24 per cent. of the greatest possible amount.

There were 6 days on which no sunshine was recorded.

July.—The month, like the preceding one, was dull, wet, and cold, and although the weather was somewhat better than that of June, yet even over the Southern Counties, where the improvement was greatest, it was, after all, not very great. Quite at the commencement of the month there occurred some unusually low night temperatures, the thermometer on the grass at Wisley falling to 36°, and in a few places it fell to the freezing-point. Generally speaking, however, the deficiency in the mean temperature was due to the remarkably low day readings rather than to the night minima, which were, as a rule, fairly normal, and so the daily range of temperature was by no means large. The latter part of the month was extremely unsettled, and the closing days were very wet. As regards sunshine, the record for the month showed a decided improvement upon that of June, especially over the southern part of England, but the total amount, although it reached 40 per cent. of the possible total, was still 28 per cent. less than the percentage recorded in May. The winds were almost entirely westerly.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	60°.4		
Highest „ „ „	75°.0 on the 18th		
Lowest „ „ „	42°.0 „ 1st		
Lowest „ on the grass	36°.3 „ 1st		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	60°.4	60°.0	57°.2
Highest „ „ „	64°.0	62°.3	58°.7
Lowest „ „ „	56°.4	57°.2	55°.3

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 73 %
Rain fell on 19 days to the total depth of ... ... 2·35 in.
(Equivalent to about 11 gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·80 in. on the 27th

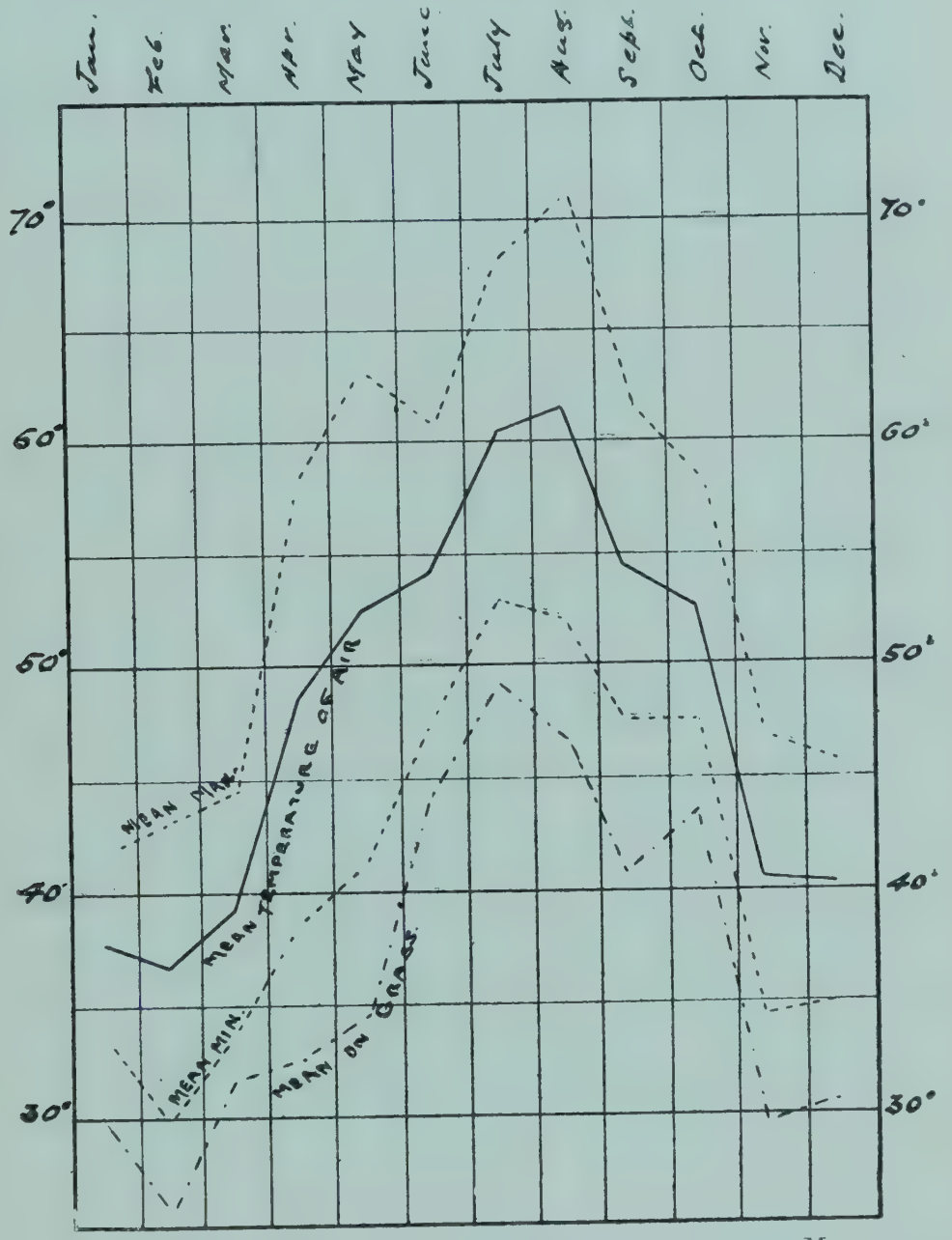


FIG. 65.—MEAN TEMPERATURE OF THE AIR; MEAN MAXIMUM AND MINIMUM TEMPERATURES OF THE AIR; AND MEAN MINIMUM TEMPERATURE ON THE GRASS, FOR EACH MONTH.

The prevailing winds were south-westerly and westerly.
The average velocity of the wind was 6½ miles an hour.
There were 196 hours of bright sunshine, equal to 40 per cent. of the greatest possible amount.
There was only 1 day on which no sunshine was recorded.

August.—The month opened with dull, cool weather, but by the 4th an improvement had taken place, and until the end of the first half

of the month it was fine and very warm, with no rain. Then the weather became again unsettled, with cool days and a good deal of rain, and this continued with very little change till the end of the month. The mean temperature for the month was about normal, because the high readings of the thermometer in the first half served to balance the colder days of the second half; the amount of sunshine also, although low for August, was yet better than in July, as that of July was an advance on the amount recorded in June. The daily amounts of sunshine were, however, frequently small, and the total was below the normal.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	61°.5		
Highest „ „ „	86°.0 on the 12th		
Lowest „ „ „	44°.0 „ 3rd		
Lowest „ on the grass	37°.0 „ 3rd		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	62°.3	62°.8	59°.7
Highest „ „ „	66°.5	64°.9	61°.0
Lowest „ „ „	58°.9	60°.1	58°.1

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 73 %

Rain fell on 13 days to the total depth of ... ... 2·16 in.
(Equivalent to about 10 gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·50 in. on the 17th

The prevailing winds were westerly.

The average velocity of the wind was 4½ miles an hour.

There were 226 hours of bright sunshine, equal to 51 per cent. of the greatest possible amount.

There were only 2 days on which no sunshine was recorded.

September.—This was another in the sequence of dull, cold months which had characterized this summer. In no part of the kingdom did the thermometer rise to more than just over 70°, and in many parts of Southern England 70° was not reached at all; indeed, at Wisley there were eleven days on which the maximum temperature was below 60°. On the other hand, the night temperature was frequently high, and, as in the preceding month, the daily range was small. There was a good deal of rain, and on the 17th a severe thunderstorm in the Thames Valley caused a fall of 1·4 in. of rain at Wisley. There were also heavy falls of rain towards the close of the month, especially over the Western Counties and in parts of Ireland. The amount of bright sunshine was small everywhere, and even in the Channel Islands, where it was most abundant, it did not amount to 50 per cent. of the possible amount. At Wisley it only amounted to 31 per cent. Northerly and north-easterly winds were predominant during the greater part of the month.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	54°.5
Highest „ „ „	70°.0 on the 6th
Lowest „ „ „	37°.0 „ 2nd
Lowest „ on the grass	30°.0 „ 10th
Number of days of ground frost	3

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	56°.6	58°.1	57°.6
Highest „ „ „	59°.1	60°.7	59°.7
Lowest „ „ „	54°.8	56°.1	56°.5

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 86 %

Rain fell on 20 days to the total depth of ... ... 3·42 in.
(Equivalent to about 16 gallons of water to the square yard.)

Heaviest fall on any day ... ... 1·41 in. on the 17th

The prevailing winds were northerly.

The average velocity of the wind was 4 miles an hour.

There were 116 hours of bright sunshine, equal to 31 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

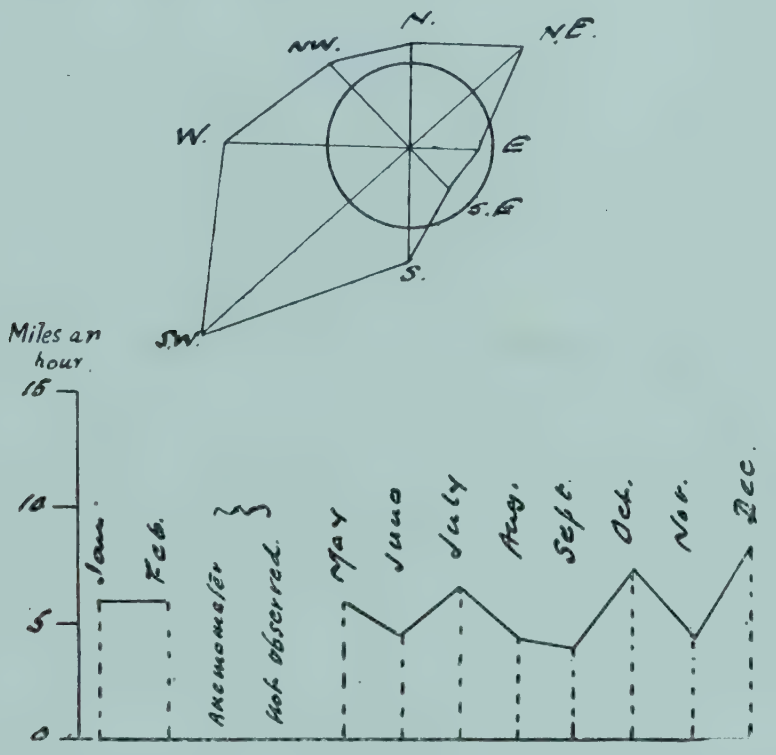


FIG. 66.—DISTRIBUTION AND VELOCITY OF THE WIND FOR EACH MONTH.

Upper diagram shows the annual distribution of winds round the compass. The prevalence of calms is indicated on the same scale by the diameter of the circle.

Lower diagram shows the mean velocity of the wind for each month of the year.

October.—The mild and moist southerly and south-westerly winds which prevailed during the greater part of this month were accompanied by a good deal of cloud and by a large fall of rain. The temperature during the day was never very high, but, on the other hand, the nights were unusually warm, owing to the cloudy skies checking terrestrial radiation, and the result was a high mean temperature. Night frosts were rare till the close of the month, when some very sharp ones were experienced, and at Wisley the thermometer on the grass fell to 22° on the night of the 29th-30th. The rainfall was very

heavy in many parts of the kingdom, especially in the South and West, while in the East and North-East it was in some districts a good deal less than the average; at Wisley rain fell on twenty-three days, and the total fall was four inches. Sunshine was generally deficient, and the winds were stronger than the average.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade		52°.7	
Highest " " "		65°.0	on the 1st
Lowest " " "		29°.0	" 30th
Lowest " on the grass		22°.4	" 30th
Number of days of ground frost		3	

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	53°.5	55°.2	55°.5
Highest " " "	57°.8	57°.5	56°.5
Lowest " " "	43°.6	48°.4	52°.3

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... 84 %

Rain fell on 23 days to the total depth of ... 4·00 in.
(Equivalent to about 18½ gallons of water to the square yard.)

Heaviest fall on any day ... 1·00 in. on the 28th

The prevailing winds were southerly and south-westerly.

The average velocity of the wind was 7·3 miles an hour.

There were only 89½ hours of bright sunshine, equal to 31 per cent. of the greatest possible amount.

There were 9 days on which no sunshine was recorded, and the average daily amount was 2·9 hours.

November.—The weather of November was in marked contrast to that of October, the warm, moist, sunless condition which then prevailed being followed by sunny but cold weather, with a mean temperature considerably below the average. Low night temperatures were not infrequent, and at Wisley the grass thermometer fell to 10° or 12° below freezing-point on several occasions. The rainfall was remarkably light; over the greater part of Great Britain it did not exceed an inch, and in many places the total fall was less than half an inch. At Wisley it amounted to less than six-tenths of an inch, the greater part of which fell during the last four days of the month. The amount of sunshine was above the normal for the month in all parts of the kingdom, and over some of the Southern and Western Counties the excess was considerable.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade		40°.6	
Highest " " "		56°.0	on the 6th
Lowest " " "		26°.0	" 9th
Lowest " on the grass		20°.0	" 23rd
Number of days of ground frost		20	

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	42°.1	45°.4	48°.3
Highest " " "	49°.3	50°.5	51°.8
Lowest " " "	36°.6	40°.9	44°.8

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... 91 %

Rain fell on 12 days, to the total depth of... ... ... 0·58 in.
(Equivalent to nearly $2\frac{3}{4}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·26 in. on the 29th
The prevailing winds were south-westerly.
The average velocity of the wind was 4·7 miles an hour.
There were $77\frac{1}{2}$ hours of bright sunshine, equal to 29 per cent. of the greatest possible amount.
There were 9 days on which no sunshine was recorded.

December.—The weather of December was very variable and unsettled, with frequent strong winds and gales, and a good deal of rain and—towards the close of the month—snow. Temperature also varied considerably, ranging at Wisley in twenty-four hours from a maximum of 54° to a minimum of 22°, and some sharp night frosts occurred. Over the Northern parts of the kingdom the mean temperature was below the average, but over the Southern and Western Counties the mean did not differ much from the normal. There were many days in succession on which no bright sunshine was recorded; but on the other hand there were a few bright intervals, and the total amount of sunshine registered, although not large, was yet not very much below the average, indeed in some districts the average was slightly exceeded.

The following are the results of the observations made at Wisley:

Mean temperature of the air in shade	40°.2		
Highest „ „ „	51°.0 on the 22nd		
Lowest „ „ „	22°.0 „ 21st		
Lowest „ on the grass	16°.0 „ 21st		
Number of days of ground frost	19		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	39°.6	41°.9	43°.9
Highest „ „ „	44°.6	43°.9	45°.4
Lowest „ „ „	31°.8	39°.1	42°.6

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 91 %
Rain fell on 20 days to the total depth of ... ... 3·00 in.
(Equivalent to about 14 gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·54 in. on the 17th
The prevailing winds were south-westerly.
The average velocity of the wind was 8 miles an hour.
There were 58 hours of bright sunshine, equal to 24 per cent. of the greatest possible amount.
There were 14 days on which no sunshine was recorded.

THE MUTATION THEORY: A CRITICISM.*

By Rev. Professor Geo. Henslow, M.A., F.L.S., V.M.H.

To explain how Professor de Vries came to broach this theory it is necessary to state his original *data* and the *conditions* of his experiments. A potato field of nearly 6,000 square yards at Hilversum, in Northern Holland, was abandoned in 1870, and has since lain fallow.

Oenothera Lamarckiana was grown in a small bed in an adjoining park, whence it began to spread into the field in 1875. In about ten years it extended over the whole of it. In 1889 intersecting paths were made, with the view of planting the plot with trees. The ground, which consists of almost pure sand, was dug up to a depth of three or four feet on both sides of the paths.

Two "species," as Professor de Vries calls them, had spontaneously appeared—*O. brevistylis* and *O. laevifolia*—first observed in 1887.

The first experiments were made in 1886, rosettes and seeds of *O. Lamarckiana* and seeds of *O. brevistylis* being planted in the experimental ground in Amsterdam.

O. brevistylis.—It was difficult to distinguish this from *O. Lamarckiana* before flowering, except by the rounded apex of the leaves. The flower-buds were shorter, thicker, and blunter, and it blossoms later into the autumn, having a corolla as large as that of *O. Lamarckiana*, but marescent. The pollen was plentiful, and transferred by humble bees; but the *style is very short*, and the *stigmas flatter*, the *fruits were small* and *had only one or two seeds*. May not this degeneration in the pistil have been a result of impoverishment from the sandy soil? Male catkins arise on the weaker twigs, but female on the stronger ones of the Cupuliferae. It was not cultivated.

An unrecorded number of seeds of *O. laevifolia* were sown in a prepared border, and gave rise to both *O. laevifolia* and *O. Lamarckiana*; but, as self-pollination was not practised until 1894, they did not always come true until that period.

The following are the peculiarities of *O. laevifolia*. It was weaker and smaller than *O. Lamarckiana*; the leaves were flatter; the petals were smaller, narrower, and not emarginate. These features obviously imply a certain amount of degeneration.

We now come to the *Lamarckiana* family, commenced in 1895. Since that time Professor de Vries says he *manured his plants heavily*, isolating any mutating individual as soon as it could be recognized as such.† In these words, as it seems to me, we have the clue to the explanation of his mutations; for in his "Species and Varieties: their

* *The Mutation Theory: Experiments and Observations on the Origin of Species in the Vegetable Kingdom.* By Hugo de Vries, Professor of Botany at Amsterdam. Translated by Professor J. B. Farmer and A. D. Darbishire. Vol. i. "The Origin of Species by Mutation." (Kegan Paul, Trench: London, 1910.)

† p. 222.

Origin by Mutation" he had observed, when speaking of the external causes of the individual differences among seedlings: * "Moisture and manure differ on different portions of the same bed in a way unavoidable even by the most careful preparation. Some seeds germinate on moist and rich spots, while their neighbours are impeded by local dryness or by distance from manure. Some come to light on a sunny day and increase their first leaves rapidly, while the following day the weather may be unfavourable and greatly retard growth. The individual differences seem to be due, at least in a very great measure, to such apparent trifles."

The mutations or "species" are named *gigas*, *albida*, *oblonga*, *rubrinervis*, *nanella*, *lata*, and *scintillans*.

Gigas is an exception to the rule of being weak, for while "most of the new forms are weaker than the parent species (*O. Lamarckiana*) this is in almost every respect stronger and bigger and more heavily built." † It only arose once in the *Lamarckiana* family and twice in others. ‡ The principal difference lies in the fruits being half as long and the seeds less numerous, but larger and heavier than those of the parent.

Rubrinervis is the only one not inferior to *O. Lamarckiana* in pollen and seed, but it has narrow and long leaves, with red ribs, red calyx and fruit. It has a more vigorous habit; but still the stems are brittle, especially of the annuals, in consequence of a *deficiency* of bast fibres. It was one of the commonest, arising sixty-six times from *O. Lamarckiana* or others. As the red colouring matter, like the red corpuscles of blood, is now regarded as an oxygen-carrier, this may account for the superior vigour of the mutation.

In contrast with the two preceding types let us take *albida*, so called from the paleness of the colours, due to impoverishment or chlorosis. The stem is very delicate and brittle. It is a slow grower, with a shorter stem than that of *O. Lamarckiana*. It survived the winter with difficulty, requiring great care to keep it alive. It would (Professor de Vries adds) most certainly have perished in the struggle for life at Hilversum, being also difficult to germinate. The leaves are narrow, very uneven and pointed, but with a bluntish tip, pale-green or whitish-grey, not due to hair, but to a swelling of the outer walls of the epidermal cells. This "species" would seem to illustrate Darwin's description: "We may feel sure that any variation in the least degree injurious would be rigidly destroyed." §

I suspect that any florist who might read the above diagnosis of this so-called "species," *O. albida*, would say that it was suffering from over-manure sickness.

It will be needless to quote so fully again; but Professor de Vries admits that with the two exceptions mentioned *all* his species were more or less delicate. Perhaps a word or two of his expressions will indicate this.

* *Op. cit.* p. 720. † p. 318. ‡ p. 227.
§ *Origin of Species*, &c., sixth edition, p. 63.

O. leptocarpa flowers late, and has long, slender fruits which seldom ripen; the stem is weak.

O. nanella, as a dwarf, is weak, often incompletely developed; it has a small quantity of pollen or none. The stigmas stick together. The author says: "These and other malformations of the dwarfs are often due to a disease, and as such depend on outer circumstances"; hence *O. nanella* should be raised as a biennial, when it is stronger.

O. scintillans is much more delicate than *O. Lamarckiana*.

O. elliptica is weak and very easily overgrown; it grew very slowly even when transplanted and treated with every possible care. Many rosettes died in the winter. Only ten plants flowered, but seed was obtained from five; the pollen is often barren. This feature is "quite normal for many species of *Oenothera*."

O. sublinearis is a weak species, mostly perishing as young rosettes; only four survived, and one only had fertile seed.

O. lata was solely female, so that its offspring were *crosses*, but De Vries calls it a "species." The stem and branches are weak, needing a support. It yielded very few seeds.

The reader will see from the preceding that from a systematic botanist's point of view scarcely one, if any, of these so-called species are worthy of the name. One cannot escape from the conviction that the features given as specific characters are simply individual variations due to a tendency to degeneration in consequence of being transferred from a xerophytic (sandy) environment to a soil supersaturated with manure. "Manure-sickness" would, therefore, be in all probability the cause of their almost universal weakness, &c.

Having now given a brief account of the characters which Professor de Vries enumerates as characterizing his "species" or "mutations," his deductions must be considered. He often alludes to Jordan's "elementary species"—i.e. the number of *constant* "forms" which, collectively, make a Linnæan species. But, as to how they arise, his view is that it is due to some *internal* causes, yet, apparently, not without some direct action of the conditions of life, as he accounted for individual differences in the passage quoted above. Still he does not appear to realize the obvious fact that in his own cultivations it was the change from a barren "sandy soil" at Hilversum to a "heavily manured" one at Amsterdam that gave rise to his, mostly, sickly race of mutants.

Why he obtained several more or less definite results was, in his view, because *Oenothera Lamarckiana* happened to be passing through a "mutation period"; that all his "species" were originally *latent* in the parent form until he cultivated them, when they put in an appearance. Here, therefore, he fails to apply his own interpretation, quoted above. For there is no reason to assume any such latency, since the changes are simply due to the *responsive power* of the protoplasm, that is *called into action* by *changed conditions of life*.

If such a latency were a universal trait of life then, it might be argued that all the fleshy maritime species were latent in the thin-

leaved inland ones of many genera, or the non-spiny pears and plums of our gardens were latent in the wild pear and sloe, &c. This conception of latency is thus easily reducible to a *reductio ad absurdum*.

Professor de Vries of course lays stress on the constancy of his forms, but that is a result to be expected, for he apparently grew them, generation after generation, in the same conditions in which they arose; and so the " direct action " of the same soil acted on the offspring in the same way as on the parent. It is a significant fact that the two kinds he found in the sandy soil of Hilversum (*O. laevifolia* and *O. brevistylis*) never appeared in his cultivations, though they seem to have proved constant when he grew them in the garden. This would be in accordance with M. E. A. Carrière's experience, who writes: " Faisons remarquer que les diverses combinaisons faites pour perpétuer les variétés, ou pour en obtenir de nouvelles, reposent sur cette loi générale que, dans la nature, *tout tend à se reproduire et même à s'étendre*, que par conséquent les modifications peuvent non seulement devenir héréditaires, mais qu'elles peuvent encore servir de moyen pour arriver à d'autres modifications, à étendre et à multiplier de plus en plus les séries typiques."*

Professor de Vries would draw the distinction between a " mutation " and a " variety " by limiting the latter to a *single* character, but such is not the view of any systematic botanist. Open Hooker's *Student's Flora* at any page, the first variety that meets the eye will be found to be only recognizable by more than one character, so that in this respect there is no difference between a mutant and a variety.

The suddenness of the appearance of the changes in a plant is a normal or general feature, provided the new environment is markedly different from that of the parent. A change to fleshiness at once occurs if plants be watered with a weak solution of salt; and, conversely, maritime plants may lose it if raised from seed in sand. Aquatic plants, as *Ranunculus heterophyllus*, grown by seed on land become very different plants, *anatomically*, for they are now in adaptation to air; but if they be transferred to water before they are fully grown the new leaves will be of the aquatic type, the aërial type perishing. M. Carrière raised spindle-rooted and turnip-rooted radishes in a loose and compact soil, respectively, from seed of the wild *Raphanus Raphanistrum*; and these forms are now hereditary.

Consequently it is difficult to accept Professor de Vries's assertion that " the laws of mutability are quite different from those of individual variation."† The degrees, if any, of difference in forms between mutations and varieties seem to be inappreciable, while those of constancy or inconstancy are the same; they both appear *suddenly*—that is to say, *while the seedling is growing to maturity*, it responds to the new conditions of life, and if the new structures it puts on render it more suitable they are *adaptations*. If they turn out unhealthy, as in Professor de Vries's " species," it proves that the environment is not a

* *Production et Fixation des Variétés dans les Végétaux*, p. 9, 1865.
† p. 6.

healthy one, and they cannot form structures so as to thrive under them. Professor de Vries makes the seemingly strange remark that "the origin of species is not the same thing as the origin of specific characters."* But a species is only known by its specific characters, and whenever these arise for the first time a new species must come into existence. He adds, "We hardly know what specific characters are." Surely any Flora in which species are described would tell him?

He says that "the only means by which breeders can get new forms is by hybridization."† Is he not aware that numerous forms of garden vegetables arose solely by cultivation in various soils—e.g., the cabbage tribe, many forms of carrots, turnips, and radishes, the *original* garden pansies, Shirley poppies?

He next remarks "that the limits of collective species arose by the dropping out of links in the chain of elementary species."† But what proof is there that the links ever existed? The "links" between his original *O. Lamarckiana* and each of his own mutants, mutations, or species—for he uses all three terms—never appeared. If the new environment be markedly different from the old one, then the seedlings grow up markedly different in response to it. The amount of change in them is regulated by that of the environment.

"The study of specific characters will some day form the most important branch of investigation."‡ This has been done by ecology. Its great value lies in the proofs (by *induction* and *experiment*) of the origin of species by response to the conditions of life. E.g. Professor E. Warming, in speaking of the xerophytic characters of desert plants, observes: "The question arises whether these adaptations to the medium should be regarded as a result of natural selection, or whether they owe their origin to the action of the conditions of the medium, in modifying forms, exercised directly. I adopt the latter view. The characters of adaptation, thus directly acquired, have become fixed and hereditary."§

Professor de Vries would regard *selection* as an element in the origin of species by mutation; but Darwin wrote: "By the term definite action [*i.e.*, of changed conditions of life] I mean the action of such a nature that when many individuals of the same variety are exposed during several generations to any change in their physical conditions of life, all or nearly all the individuals are modified in the same manner. A new sub-variety would thus be produced without the aid of selection."‖

Ecology has proved this to be the true and only origin of species. Yet Professor de Vries, while referring to the fact that "many authors have suggested that altered conditions of life exert a direct influence on animals and plants . . . and evoke an adaptive response," nevertheless repudiates it by saying: "But this assumption [?] seems to be no more than a begging of the question we are trying to answer."¶ The Professor thus confesses that he knows not what ecology has done!

* p. 56. † p. 59. ‡ p. 60. § *Lagoa Santa*, p. 465. 1892.
‖ *An. and Pl. under Dom.* ii. 271. ¶ p. 200.

COMMONPLACE NOTES.

By the Secretary, Superintendent, and Editor.

Injurious Fumes from Stokehole Chimneys.

On several occasions during the past few years we have seen bad results due to the stokehole chimney being erected too near glass structures. The fumes of sulphur dioxide and other gases penetrate into the houses and do much damage when the wind is blowing so as to drive them over the glass, particularly when the ventilators are a little open. Not long ago we saw both vines and peaches with severely scorched foliage and fruit partly scalded, the whole appearing as if the ventilation had been grossly mismanaged, while other houses under the same man's charge and only a short distance away were in excellent condition. On investigation it was found that the chimney was at the end of these damaged houses, and its top almost level with the ridge, and whenever there was a south or south-west wind the fumes were blown right in. In this case the evil was aggravated by the position of the chimney as the weather was always warmer and ventilation necessary when the wind was in the directions mentioned. As it would have been very costly to have moved the stokehole and rearranged the heating apparatus, the chimney was raised twenty feet, with satisfactory results. An almost similar instance occurred with a range of plant houses where the chimney was at one end of the range, the damage always being worst in the winter, when extra firing was necessary and when flowers were most precious. In spite of well glazed houses the fumes found an entrance when the wind was in a quarter that drove them over the glass. Raising the height of the chimney in this case improved matters, and only occasionally was any injury done. But all danger would be avoided if the chimneys were placed a little distance away and built sufficiently high to carry the fumes away and above the glass.

Undesirable Water Plants.

Of all the undesirable water plants planted in ponds *Villarsia nymphaeoides* is the worst the writer knows. Its pretty neat yellow blossom and bronzy leaf are most attractive, and it would be a welcome plant for the water garden if it would keep in bounds; but it grows and spreads so rapidly that it will quickly cover a large sheet of water and smother all the other aquatic plants in the place. We have tried to eradicate it by thoroughly cleaning out the pond, taking out every root that could be found, and leaving the pond perfectly dry for a month or more. Yet the following year it was as bad as ever.

It is a very curious fact that in some ponds and lakes *Aponogeton distachyon* absolutely refuses to live, in spite of the most careful attempts

to establish it, while in others it grows so rampantly as to crowd out everything else. But the pleasant scent of its flowers compensates largely for its other drawbacks. Bullrushes, if kept within bounds, give a pleasing appearance to the margin of a lake, but one ought to be very careful how they are introduced, because they will grow well into deepish water and spread far out, making it very difficult to get them out by the root, and unless they are kept in bounds by pulling them out roots and all they soon diminish the size of the lake and become a nuisance. Some of the rushes are as bad, and *Acorus Calamus* is apt to spread too much. With such a host of beautiful aquatic plants to choose from that give little trouble it is scarcely worth while to plant those of a doubtful character.

Destructive Insects and Pests.

The Board of Agriculture and Fisheries are making determined efforts to deal with several of the more dangerous pests of cultivated crops, and the attention of Fellows is drawn to the following "Order" recently issued by the Board, particularly as some of the pests are widespread and common and liable to be met with in almost any garden. Most of the pests mentioned in the "Order" have been referred to frequently in the "Notes and Abstracts" in this Journal, and some have been recently dealt with at length.

It should be clearly understood that "The American Gooseberry Mildew Order of 1909," which ordered the notification of the occurrence of the American Gooseberry Mildew, and gave directions for the action to be taken by Local Authorities in dealing with it, is *not* revoked by this Order, so that the "American Gooseberry Mildew," *Sphaerotheca mors-uvae*, is still a notifiable pest.

The following is the text of the recent Order:—

Destructive Insects and Pests Order of 1910.

The Board of Agriculture and Fisheries, by virtue and in exercise of the powers vested in them under the Destructive Insects and Pests Acts, 1877 and 1907, do order, and it is hereby ordered, as follows:—

Notification of Discovery of Insect or Pest.

1.—(1.) The occupier of any premises on which an insect or pest mentioned in the Schedule to this Order exists, shall forthwith notify the fact, with particulars of the time and place of discovery, to the officer appointed by the Local Authority to receive such notices, or, if no such officer has been appointed, to the Board; and, where practicable, a specimen of the insect or pest shall accompany the notice.

(2.) An officer of a Local Authority who receives a notice under this Article shall forthwith report the fact to the Local Authority.

(3.) The Local Authority on receiving in any manner notice of the existence or apparent existence of an insect or pest mentioned in the Schedule to this Order shall forthwith transmit the information to the Board and take such steps as may be necessary to determine to what extent the insect or pest exists.

Powers of Entry.

2. An Inspector or other officer appointed in that behalf by the Local Authority and any Inspector of the Board may, upon production if so required of his appointment or authority, enter any premises on which he has reason to believe that an insect or pest mentioned in the Schedule to this Order exists or has recently existed, and examine any plant, fruit, crop, seeds, tubers, bulbs, layers or cuttings on such premises.

Action to be taken by Local Authority.

3.—(1.) An Inspector or other officer of the Local Authority or of the Board, acting under their direction, may at any time and from time to time by a notice served on an occupier of premises on which an insect or pest mentioned in the Schedule hereto exists or recently has existed, require him to adopt such measures for prevention of the spread of the insect or pest as are specified in the notice.

(2.) Where a Local Authority have consented to pay compensation for such destruction, the notice under this Article may require the occupier of premises on which an insect or pest mentioned in the Schedule hereto exists or recently has existed, to destroy by burning or other effective method all or any of the plants, fruit or crops on the premises, and the Local Authority shall pay compensation for such destruction subject and according to the provisions in that behalf of the Destructive Insects and Pests Acts, 1877 and 1907.

(3.) A notice under this Article may prescribe the time within which the adoption of any measure thereby prescribed shall be completed.

(4.) An occupier may appeal to the Board against a notice served on him under this Article by an Inspector or other officer of the Local Authority, and the Board may, after consultation with the Local Authority, cancel the notice or modify its requirements in such manner as the Board think fit.

(5.) For the purposes of this Order a notice shall be deemed to be served on a person if it is delivered to him personally or left for him at his last known place of abode or business or sent through the post in a letter addressed to him there, and a notice or other document purporting to be signed by an Inspector or other officer of a Local Authority or of the Board shall be *primâ facie* evidence that it was signed by him acting under the directions of the Local Authority or the Board as the case may be.

Penalty on Sale or Use for Planting of Diseased Seeds, &c.

4. Every person who shall knowingly use, or sell for use, for planting any plant, seed, tuber, bulb, layer or cutting attacked by an insect or pest mentioned in the Schedule to this Order, or any seed, tuber, bulb, layer or cutting which has been derived from a plant so attacked and is capable of spreading the insect or pest, shall be liable on conviction to a penalty not exceeding ten pounds.

Prohibition of Sale of Specimens.

5. It shall not be lawful, except with the written permission of the Board, to import, sell, or offer for sale a living specimen of any insect or pest mentioned in the Schedule to this Order.

Penalties.

6. Every person shall be liable on conviction to a penalty not exceeding ten pounds, who—

(1) knowingly fails to give such notification as is required by Article 1 of this Order; or

(2) fails to adopt such measures for prevention of the spread of the disease as are specified in a notice served on him under this Order; or

(3) wilfully obstructs or impedes any Inspector or other officer when acting under this Order; or

(4) imports, sells or offers for sale an insect or pest in contravention of this Order.

Notification of Order.

7. This Order shall be published by the Local Authority in accordance with any direction given by the Board.

Revocation of Order.

8. The Destructive Insects and Pests Order of 1908 is hereby revoked.

Execution of the Order.

9. Each Local Authority shall carry into effect this Order within their District, and shall appoint such Inspectors or other officers for that purpose as may be necessary.

Definitions.

10. In this Order—

"The Board" means the Board of Agriculture and Fisheries;

"Local Authority" means a local authority having power to execute and enforce the Diseases of Animals Act, 1894; and "District" means the area in which the Local Authority has such power to act.

Application of the Order.

11. This Order shall apply to Great Britain.

Short Title.

12. This Order may be cited as the DESTRUCTIVE INSECTS AND PESTS ORDER OF 1910.

L. S.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their Official Seal this third day of May, nineteen hundred and ten.

T. H. MIDDLETON,
Assistant Secretary.

SCHEDULE.

Insects and Pests to which this Order applies.

The Vine Louse (*Phylloxera vastatrix*, Planchon).
The San José Scale (*Aspidiotus perniciosus*, Comstock).
The Mediterranean Fruit Fly (*Ceratitis capitata*, Wiedemann).
The Colorado Beetle (*Doryphora decemlineata*, Say).
The Large Larch Sawfly (*Nematus erichsonii*, Hartig).
The Potato Moth (*Lita solanella*, Boisduval).
The Gipsy Moth (*Liparis* (*Ocneria*) *dispar*, Linné).
The Brown Tail Moth (*Euproctis chrysorrhoea*, Linné).
The Nun Moth (*Liparis monacha*, Linné).
The Cherry Fly (*Rhagoletis cerasi*, Linné).
The Narcissus Fly (*Merodon equestris*, Fabricius).

Black Knot (*Plowrightia morbosa*, Saccardo).

Wart Disease or Black Scab of Potatos (*Synchitrium endobioticum*, Percival).

Tomato Leaf Spot (*Septoria lycopersici*, Spegazzini).

Melon or Cucumber Canker (*Mycosphaerella citrullina*, Grossenbacher).

American Pear Blight (*Micrococcus amylovorus*, Burrell).

Statistics of Interest to British Horticulturists.

The following statistics, abstracted from the Government Trade and Navigation Returns for 1909, are in continuation of those appearing in the R.H.S. Journal, vol. xxxv., pp. 60-62:—

TABLE I.—SHOWING THE IMPORTS OF FRUIT AND VEGETABLES DURING 1907-9.

—	Quantities			Values		
	1907	1908	1909	1907	1908	1909
FRUIT:				£	£	£
Apples, raw . . . (cwt.)	3,526,232	3,376,579	3,129,646	2,231,327	2,079,703	2,007,911
Apricots and Peaches . „	38,814	30,620	52,724	78,583	60,141	83,443
Bananas, raw . . (bunches)	6,232,158	6,385,449	6,238,065	1,771,095	1,769,249	1,752,190
Cherries, raw . . . (cwt.)	165,412	160,479	185,464	199,489	234,883	210,679
Currants, raw . . . „	109,130	101,921	131,442	142,245	121,659	151,552
Gooseberries, raw . . „	45,603	44,518	27,078	25,994	25,529	13,496
Grapes, raw . . . „	798,377	673,670	490,003	769,307	728,022	508,111
Lemons . . . . „	882,193	1,045,009	1,037,984	421,599	471,613	475,967
Nuts: Almonds . . . „	161,947	148,839	162,922	660,604	560,301	710,325
„ other nuts, used as fruit „	702,598	752,179	741,374	749,538	768,560	789,798
Oranges . . . . „	6,120,185	5,664,041	6,202,271	2,454,569	2,269,731	2,522,491
Pears, raw . . . . „	500,132	523,029	569,467	478,611	515,924	504,423
Plums, raw . . . . „	325,761	402,881	486,757	345,720	427,212	474,749
Strawberries, raw . . „	44,178	33,391	36,829	54,186	45,791	47,877
Unenumerated, raw . . „	538,465	436,947	464,212	339,462	291,325	306,031
FRUIT, DRIED:						
Currants . . . . „	1,188,481	1,297,157	1,052,417	1,392,271	1,464,091	1,114,912
Raisins . . . . „	708,053	759,787	858,982	1,209,576	1,204,074	1,142,969
VEGETABLES, RAW:						
Onions . . . . (bushels)	8,645,048	7,896,109	7,470,775	1,036,231	993,669	1,213,518
Potatos — From Germany . (cwt.)	799,788	674,486	21,007	148,564	128,429	3,906
„ France . „	2,996,640	3,147,450	2,120,022	852,344	721,833	517,439
„ Channel Islands . „	1,946,817	1,206,607	1,461,794	742,518	564,172	615,490
„ Other countries „	2,506,121	2,010,780	680,043	628,119	552,782	271,416
Total	8,249,366	7,039,323	4,282,866	2,371,545	1,967,216	1,408,251
Tomatos . . . (cwt.)	1,135,499	1,160,283	1,161,308	1,020,805	955,985	954,400
Unenumerated	365,230	371,209	—	365,230	371,209	402,739
FLOWERS, FRESH . . value £	—	—	—	233,641	229,802	244,855

The figures for 1909 in Table I. show no striking variation from those of the two former years, except in the following instances: The import of apples is less by 247,000 cwt. compared with that of 1908, which year in turn was 150,000 cwt. lower than 1907. Pears, by comparison, show a rising import of nearly 70,000 cwt. in excess of 1907. This is probably in some measure due to the improved methods of transportation afforded to pears from South Africa, enabling large shipments to reach London from the Cape.

The price of onions shows a pronounced variation—namely, an increased value of £220,000 with a reduced import of 426,000 bushels. Potatos received from abroad, despite the wet and sunless season of 1909, sank to the same low figure returned in 1906—a reduction of 50 per cent. on 1908.

Apples, onions, and potatos represent our most important home-grown fruits and vegetables, and the pronounced lowering of their imports compared with the increasing consumpton resulting from our growing population would seem to indicate that the British Isles are being made more productive in these valuable comestibles, and prices are competing successfully in the open market.

The increasing demand for fresh flowers is again demonstrated by an import valued at £244,855, an excess of £11,000 over 1907 and £15,000 over 1908.

Our Society has done much in recent years by lectures, exhibitions, &c., to stimulate the growth of the bottled-fruit industry, and the consumption of fruits so prepared, and it is, consequently, not a little satisfactory to find in the following Table (II.) an export of 54,000 cwt. over that of 1908, representing an income to the country of £150,000. The short time that has passed since the revival commenced in production and consumption makes the return the more promising for future developments and justifies our Society's efforts and judgment in this work.

TABLE II.—SHOWING THE EXPORTS OF FRUIT, &c., 1907-9.

—		Quantities			Values		
		1907	1908	1909	1907	1908	1909
					£	£	£
FRUIT:							
Lemons	(cwt.)	27,612	20,157	23,822	14,544	9,915	11,328
Oranges	"	340,294	248,241	223,709	136,475	100,739	94,514
FRUIT, DRIED:							
Currants	"	21,829	22,128	18,467	31,328	27,012	22,378
Raisins	"	42,101	14,667	15,727	69,977	26,824	24,209
JAMS, PRESERVED FRUITS, AND CONFECTIONERY	"	429,742	423,956	477,220	1,081,544	1,092,001	1,242,440
PICKLES AND VEGETABLES PRESERVED IN SALT OR VINEGAR	(gall.)	794,762	670,709	801,746	168,433	139,599	166,992
PROVISIONS, UNENUMERATED		—	—	—	590,000	582,021	600,558

The fruits shown in the foregoing export return, preserved fruits and pickles excepted, are mainly re-exported imports, and this goes to prove that our home-grown horticultural produce finds a market

ready and sufficient for it in our own country. To growers this must surely be a satisfactory reflection, and Tables I. and II. will assist them to determine in which direction extension is likely to prove profitable.

Timber imports are lessening in quantity possibly because of a depression in the building trade. Values appear to be normal. The change in the fashion of furniture wood is apparent in the great decrease in mahogany veneers received. A testimony to English workmanship is given in Table IV. by the excellent return of exported wood manufactures.

TABLE III.—SHOWING THE IMPORTS OF WOOD AND TIMBER DURING 1907-9.

—		Quantities			Values		
		1907	1908	1909	1907	1908	1909
WOOD AND TIMBER:					£	£	£
Hewn: Fir, Oak, Teak, &c. (other than Pit Props or Pit Wood)	(loads)	885,011	839,010	801,681	3,939,936	3,299,140	2,855,589
Hewn: Pit Props or Pit Wood	„	2,627,209	3,041,241	2,626,480	3,049,484	3,579,355	2,928,249
		3,512,220	3,880,251	3,428,161	6,989,420	6,878,495	5,783,838
Sawn or split, planed or dressed	„	5,985,588	5,488,430	5,722,081	17,146,823	14,521,127	15,469,855
Staves of all dimensions	„	171,721	147,025	126,339	736,422	682,105	546,187
Furniture Woods, Hardwoods and Veneers:							
Mahogany	(tons)	104,112	119,481	76,202	893,288	1,012,949	609,352
Other sorts	„	199,953	189,672	196,702	1,327,101	1,211,493	1,182,578
Total of Wood and Timber		—	—	—	27,093,054	24,306,169	23,591,810
MANUFACTURES OF WOOD AND TIMBER:							
Furniture and Cabinet Ware		—	—	—	565,429	447,932	391,236
House Frames, Fittings, and Joiners' Work		—	—	—	224,596	209,632	185,487
Other sorts (including Wood Ware and Wood Turnery)		—	—	—	1,130,691	1,313,353	1,477,546
Total of Manufactures of Wood and Timber		—	—	—	1,920,716	1,970,917	2,054,269

TABLE IV.—SHOWING THE EXPORTS OF WOOD AND TIMBER DURING 1907-9.

—		Quantities			Values		
		1907	1908	1909	1907	1908	1909
WOOD AND TIMBER:							
Rough, hewn, sawn or split, and staves	(loads)	17,719	16,962	18,458	111,841	98,218	108,395
MANUFACTURES OF WOOD AND TIMBER;							
Furniture and Cabinet Work		—	—	—	801,603	661,265	748,512
Other sorts		—	—	—	606,329	595,540	702,111
Total Manufactures of Wood and Timber		—	—	—	1,407,932	1,256,805	1,450,623

BOOK REVIEWS.

"The Face of the Earth." By Edward Suess. Translated by Hertha B. C. Sollas. Vol. iv., 4to., viii. + 673 pp. (Clarendon Press, Oxford, 1909.) 25*s*. net.

We have already noticed the first three volumes of this work, and the remarks then made apply equally to this volume (see JOURNAL R.H.S., xxxv., p. 232). The whole book is one that every serious student of geology must read for himself, and it is unnecessary to say more than that the masterly survey of the earth's form and past history and a consideration of those of the moon are continued in the present volume. The printing and arrangement of the book are, as usual with publications of the Clarendon Press, of the best.

"British Wild Flowers in their Natural Colour and Form." Text by Rev. Professor Henslow, with illustrations by Grace Latton. 8vo., xii. + 318 pp. (Society for Promoting Christian Knowledge, London, 1910.) 8*s*.

This is not a flora like Johns' excellent book published by the same Society, but is designed to give interesting information with legendary lore and notes on the derivation of names of the commoner British plants. The letterpress is to some extent based upon Anne Pratt's widely-known "Wild Flowers," but parts of that have been omitted entirely, and much other matter has been included.

We hardly feel that the publishers can be congratulated upon the illustrations, which are rather poor examples of colour-printing. In general form the plants depicted are usually accurate, but insufficient detail is shown to make them of value as botanical drawings. We cannot help but think the pictures have lost much in reproduction. The letterpress is arranged according to the natural method of classification, but on the plates we find the bulbous buttercup cheek by jowl with the bluebell, and buckwheat with sneezewort, and some even more incongruous associations.

"Soils and Manures." By J. A. Murray, B.Sc. 8vo., xiii. + 354 pp. (Constable, London, 1910.) 6*s*. net.

This text-book of soils and manures contains little that is new either in matter or treatment, but it gives a good review of our knowledge of soil chemistry and the use and value of manures, a fairly full account of soil biology, and an informing chapter upon the physical properties of soils. One could, however, wish that, as with the chemistry of soils, the author had endeavoured to correlate the physical character of soils with the requirements of the crops they bear. A considerable body of

facts in this direction is already available, though a great deal remains to be done.

The author recognizes the dangers of placing too great reliance upon the composition of the soil as revealed by chemical analysis as a direct guide to manuring, as well as the folly of relying upon the analysis of the plant; and the reader will find plans by which he may gain information regarding the manurial requirements of the plant by means of trial plots.

Altogether the author has produced an excellent book, which farmers, fruit-growers and market gardeners who have some knowledge of elementary chemistry will find valuable.

"The Young People's Microscope Book." By Rev. S. N. Sedgwick, M.A. 8vo., 300 pp. (Culley, London, 1910.) 3*s*. 6*d*. net.

This book is intended to give young people plain directions as to the use of a cheap compound microscope, with methods of constructing apparatus at a merely nominal cost, and to direct their attention towards the most profitable places in which to search for interesting objects. The author is an enthusiast upon his subject, and the youthful enquirer would find in him a genial and safe guide to the mysteries of microscopy so far as a beginner with a small instrument and plenty of inquisitiveness may hope to know them.

"Manual of Physical Geography." By F. V. Emerson, Ph.D. 8vo., xvii. + 291 pp. (Macmillan, New York, 1909.) 6*s*. net.

This is a school-book of physical geography, consisting mainly of a variety of exercises, and applying for the most part to conditions obtaining in the United States. The teacher desirous of furthering Nature-study will find herein some stimulating suggestions.

"Common Weeds of the Farm and Garden." By H. C. Long, B.Sc., and J. Percival, M.A., F.L.S. 8vo., xviii. + 451 pp. (Smith, Elder, London, 1910.) 6*s*. net.

There are many books dealing with fungus and animal pests of the farm and garden, but we have waited long for one on weeds, and now it has come we can have nothing but praise for it. Weeds are not an altogether unmixed curse to the gardener, for sometimes he is induced to hoe between crops to keep them down, and the crops naturally benefit greatly; and weeds are often useful in other ways, but some are masterful and well adapted to hold their own against most of the garden's crops.

In the present work, which is well and copiously illustrated and well printed on good paper, one may learn not only how to identify the weeds commonly met with, but how to check their progress and avoid their return. There are figures and descriptions of the weeds peculiar to various habitats, and of the tools designed to keep them in check; recipes for weed-killers; a chapter on the principles of seed-testing; the opinions of authorities on the worst weeds of certain districts; lists of literature dealing with various aspects of the subject;

and an appendix detailing the legislation directed in various countries towards checking the introduction and spread of weeds.

The author and his collaborator, the artist, and the publishers, have all done their respective parts well, and have produced a readable and instructive book.

"The Principles of Soil Management." By T. L. Lyon, Ph.D., and E. O. Fippin, B.S.A. 8vo., xxxiii. + 531 pp. (Macmillan, London, 1909.) 7*s.* 6*d.* net.

Many works have appeared on the soil in recent years, but none, so far as we have seen, deal in such a thorough, though elementary, way with the question as this one. It is arranged in an excellent style, and its several parts deal with (1) the soil as a medium for root development (132 pages); (2) the soil as a reservoir for water (133 pages); (3) plant nutrients in the soil (121 pages); (4) organisms in the soil (44 pages); (5) soil air (33 pages); and (6) external factors of soil management (66 pages).

The student—and every gardener must be a student all his life—will find much to instruct him and a great deal to help him in making the conditions for his crops more suitable if he will read and apply in a reasonable way the lessons this book contains. It is one that may be relied upon to provide a sound basis upon which he may build.

"Zambesia: a General Description of the Valley of the Zambesi River from its Delta to the River Aroangwa, with its History, Agriculture, Flora, Fauna, and Ethnography." By R. C. F. Maugham, H.B.M. Consul for Portuguese East Africa. With map and 42 illustrations. 8vo., xiv. + 408 pp. (Murray, London, 1910.) 15*s.* net.

Although many English people travel to British Nyasaland or Rhodesia every year, the actual valley of the Zambesi with which this volume is concerned is seldom visited by British travellers, and is by no means well known.

Mr. Maugham's book will therefore be an exceedingly useful work of reference. The chapters dealing with the ancient history of Portuguese occupation and with the adventures of the first explorers in their search for the more or less legendary gold and silver mines of Monomatapa are full of interest, and give an excellent idea of the methods employed by the Portuguese at a period when they were the first sea power in the world. Other chapters in this volume describe the present methods of administration, the Portuguese Chartered Companies of to-day, the system of Prazoes and the characteristics of the British Indians, and other present-day settlers in Zambesia. Readers of this JOURNAL will be specially interested in the accounts of the coco-nut palm and sugar plantations, of the apparent failure of the cotton plant in Zambesia (through what Mr. Maugham describes as the "greenfly pest," 'Malvacearum'), and of the showy Calpurnias, Crinums, Palms, "thorn-bearing abominations," the "loathly cow-itch bean mucuna," and other impressive plants. There are chapters on

the flora, reptiles, birds and insects, zoology, climate, and health, as well as three others dealing with the characteristics, superstitions, and folklore of the natives. Several native animal stories are given in full. There are also graphic descriptions of the scenery and rock gorges in the Zambesi and Barue, which are illustrated by exceedingly clear and artistic photographs. Moreover, the book is not only a valuable work of reference, but it is written in a lively and interesting way.

But although Mr. Maugham's book leaves a very clear impression of Zambesia on the mind of the reader, it seems at least doubtful if the picture is not of a much too roseate character. One would hardly gather from this volume that the climate is thoroughly unhealthy for Europeans. The prospects of any successful cultivation are very much affected by this fact. Moreover, however greatly the methods of Portuguese government may have improved during the last ten years, there is still an enormous difference in the administration of Portuguese and of British territories. Very few British writers seem to understand Portuguese, and the story of that extraordinary half-caste genius "Gouveia" is very significant. It reveals what inevitably happens when weakness prevails in the government of native possessions.

As regards other points of less importance, it seems to be generally admitted that the Zambesi is becoming more shallow every year.

Mr. Maugham's explanations are not very easy to follow. It seems rash to suggest that "Lake Nyasa may have sprung some terrific leak, and that . . . an immense foaming torrent goes thundering seaward, and, for aught we know to the contrary, may be now delving out the bed of some unknown, unsuspected, and unnamed river."

The gradual silting up of the river bed, or else perhaps a diminution in the rainfall over the catchment area of the Zambesi, would appear at first sight to be more plausible explanation than any of those suggested by Mr. Maugham.

The larvæ of one of the "ticks," *Ceratopogon*, are, on p. 221, said to be "laid in star-shaped clusters of Algae containing from 100 to 150 eggs." Insects' eggs are, of course, often found entangled in Algae, which, we suppose, is what Mr. Maugham means.

Lists of plants collected by the author and of birds and mammals are given at the ends of the chapters, but are without localities.

The author does not agree with Mr. Selous as to the disappearance of the tsetse fly when buffalo and other big game have left a district, which is a point of great importance to the future of Portuguese East Africa. A very old friend appears again in the following: "A friend of mine in South Africa . . . informed me that the mamba" (snake) "spat out the poison in a long jet, as though it had issued from a fine yet powerful syringe."

"The Senior Botany." By F. Cavers, D.Sc., F.L.S. 8vo., 464 pp. (University Tutorial Series, London, 1910.) 4*s*. 6*d*.

This strikes us as being the best of the many elementary books on botany we have seen. It deals very thoroughly with each subject, and

provides the student with numerous questions at the end of the chapters, and also with others, suggesting thought and investigation incidentally in the text. It is well illustrated throughout, and the final chapter on Ecology is a distinct and valuable feature; but the fact that "Adaptation by response" is the real "cause" of variations might be more strongly emphasized; there Mr. McCallum proved *experimentally* that the dissected type of submerged leaf in *Proserpinaca* was the result of supersaturation by water.

A few other suggestions might be made. No mention appears to occur of transpiration being especially due to red and violet rays of the spectrum (p. 122). Spinescent processes are shown by Ecology to be the direct result of drought, not formed specially as a protection against browsing animals (p. 185). Camels live on the thorny bushes of desert countries. Has it ever been proved that pollen of anemophilous plants is lighter than that of others? (p. 246).

The figure of the corymb is inexact. If the bracts are opposite, each pedicel would be a secondary peduncle and bear a pair of pedicels, as in Caryophyllaceae (p. 230).

The leaves of *Ranunculus Ficaria* are not strictly opposite, but alternate on opposite sides of the axis. This is suggested to be a result of the single cotyledon (not mentioned).

Self-pollination (following Darwin's error) is described (p. 217) as inferior in its effects to cross-pollination; but examples on pp. 214, 237, 238 prove the contrary. The diagram of a root-tip (p. 160) would apply to a Monocotyledon, in which the root-cap has its origin *independent* of the initial cells of the root, not of a Dicotyledon, rightly described in the text.

Speaking generally, the book is an admirable one, especially for encouraging close, accurate, and abundant *observation* on the part of the student.

"Charles Darwin and the Origin of Species; Addresses, &c., in America and England." By E. B. Poulton, D.Sc., M.A., F.R.S., &c. 8vo., 302 pp. (Longmans, London, 1909.) 7*s*. 6*d*. net.

The book contains the following:—Fifty Years of Darwinism; The Personality of Darwin; The Darwin Centenary at Oxford; Darwin and the University of Cambridge; Colour and Mimicry; Letters from Darwin to Roland Trimen; and four appendices. The first address treats of the following, amongst other matters:—Erasmus Darwin and Lamarck, The Influence of Lyell, Foreshadowings of Natural Selection, The Publication of the Darwin-Wallace Essay, Echoes of the Storm, Attacks of Owen and St. G. Mivart, Lamarck's Hypothesis and the Hereditary Transmission of Acquired Characters, &c.

Prof. Poulton called Darwin's and Wallace's communications a "joint essay," but in the "Journal of the Linnean Society" they are perfectly distinct. There were three papers—(1) "Extract from an Unpublished Work on Species by C. Darwin"; (2) "Abstract of a Letter from C. Darwin"; and (3) "On the Tendency of Varieties to

depart indefinitely from the Original Type,'' by Wallace. It is interesting to note that while Darwin collected his data chiefly from "Animals and Plants under Domestication," Wallace says:—"We see, then, that no inferences as to varieties in a state of nature can be deduced from the observation of those occurring among domestic animals."

Speaking of Dr. F. Darwin's belief in "the transmission of acquired characters as being implied by the persistence for unnumbered generations of the successive developmental stages through which the individual advances towards maturity," the author observes that "Weismann's hypothesis of the continuity of the germ-plasm supplies a sufficient mechanism." *Assuming* that germ-plasm exists, the "persistence" may be accounted for; but is it not best to look for facts? These are perhaps more easily seen in plants than animals; and if it be true in the former, it is a strong inference that it is also in animals. The 'Virginian Creeper' never makes adhesive pads before contact with a wall. A mechanical irritation is sufficient to invite the response. In the Japanese species the pads are partially formed *before* contact—*i.e.* they are not only "acquired" but "hereditary." Prof. Poulton observes:—"It is well known that plants have the power of adjusting themselves to their individual environment . . . the hereditary transmission of the results of its exercise is especially dangerous." Why so? If a plant has for generations adapted itself to a particular environment but cannot readapt itself to another, it will die; but this is *not* the usual result. The water crowfoot is adapted to live submerged; but it produces stronger plants if the seed be sown on land. Yet it retains the "acquired" dissected foliage. This example seems to refute Prof. Poulton's assertion—If a species possessing the power of individual adaptation ultimately came to live permanently in one set of conditions [*e.g.* as a submerged plant], and thus ceased to need it, the power itself, no longer sustained by selection [*i.e.*, *assumed* to be so], would sooner or later be lost. [This is an unproven assumption.] The fleshy character of the samphire is regarded as an "acquired" character, because it is proved experimentally to be due to salt. Yet when grown inland it becomes a thin-leaved plant. As Dr. F. Darwin says, corroborating his father,* "the permanent condition is a final result of the hereditary transmission [of fluctuating or individual differences] by the same response through a large number of generations."

Prof. Poulton refers to the neglect of adaptation as due to Huxley, who was "not a naturalist, far less a student of living nature." But adaptations in plant life have been almost exhaustively studied since Darwin led the way. He was the first and greatest of our ecologists.

Prof. Poulton elsewhere says:—"This Lamarckian conclusion, that the adaptive response has been caused and not merely evoked by environmental stimuli is well criticized by de Vries." We do not see the difference between "caused" and "evoked." The "stimulus"

* *An. and Pl. under Dom.* ii. 271.

is drought in the desert, to which de Vries refers. The "response" is "adaptations," *e.g.* thick cuticle, fleshiness, spinescence, &c. Stability may or may not remain. *Zilla myagroides*, a spiny bush in the desert, becomes a large-leaved spineless plant in cultivation. But African fleshy Euphorbias remain so, wherever they be grown, contrary to the statement that "nothing in the way of stability has resulted from the action of the dry soil." *

An essay on "The Personality of Darwin," dealing with the enormous amount of work done under the most distressing ill-health gives an insight into his patient endurance and determination, and how essential work was to him. He showed "how clearly he recognized that the love of knowledge for its own sake was the one essential qualification of a scientific man."

Other essays deal with Darwin's views in connexion with colour and mimicry, of which Prof. Poulton is so excellent an exponent.

Altogether the work is a most important one; and the writer has put together a large amount of matter in which Darwin is always the central and attractive figure.

"The Naturalist on the River Amazons: a Record of Adventures, Habits of Animals, Sketches of Brazilian and Indian Life, and Aspects of Nature under the Equator, during Eleven Years of Travel." By Henry Walter Bates, F.R.S. 8vo., x. + 394 pp.; with 39 illustrations. (Murray, London, 1910.) 1*s.* net.

Although Bates landed at Paraguay in 1848, and although the original volume was published so long ago as 1863, this classic story of a naturalist's adventures is still most interesting, and is even an essential part of a scientist's education.

The catholic nature of his interest in the strange and new country, of which he was one of the earliest scientific pioneers, is perhaps one of the reasons for the extraordinary charm of this volume.

In modern books of travel one finds that naturalists have visited some of the most out-of-the-way parts in the world simply to study the Jungermanniaceae or the Buprestidae.

Bates was enthusiastic about everything, keenly interested in Indians, beasts, birds, insects, and plants of every sort and kind.

What could better this description of a common variety of tropical vegetation?—"There was not much green underwood except in places where bamboos grew; these formed impenetrable thickets of plumy foliage and thorny, jointed stems, which always compelled us to make a circuit to avoid them. The earth itself was encumbered with rotting fruits, gigantic bean-pods, leaves, limbs and trunks of trees; fixing the impression of its being the cemetery as well as the birth-place of the great world of vegetation overhead. Some of the trees were of prodigious height. We passed many specimens of the Mora, whose cylindrical trunks, I dare not say how many feet in circum-

* "The Centenary of Darwin," *Quarterly Review*, July 1909, p. 36.

ference, towered up and were lost amidst the crowns of the lower trees, their lower branches in some cases being hidden from our view."

Then he describes the poisonous tree, *Sapium* sp., whose milky sap "is said to cause incurable sores."

Then there are fascinating descriptions of the habits of insects, as, for instance, those of the sand wasps and mason bees. Even to-day it would be very difficult to discover a better introduction to these interesting creatures than he gives us.

One of them excavates its mine on a "sandbank recently laid bare in the middle of the river." It has to travel half a mile in order to catch the unfortunate fly with which it provisions its cell. Yet it returns "without hesitation straight for the closed mouth of the mine." This, as he explains, must be due to "a mental process in each individual, differing from the same in man only by its unerring uncertainty."

Bates was, of course, most interested in birds, monkeys, alligators, tortoises, and insects. His descriptions of the formidable ants which seem to dominate the valley of the Amazons, and hold their own even against mankind, are amongst the most valuable of existing observations. "The main column, from four to six deep, moves forward in a given direction, clearing the ground of all animal matter, dead or alive, and throwing off here and there a thinner column to forage. . . . If some very rich place be encountered anywhere near the line of march—for example, a mass of rotten wood abounding in insect larvæ, a delay takes place and a very strong force of ants is concentrated upon it. The excited creatures search every cranny, and tear in pieces all the large grubs they drag to light."

The Indians are described exactly as he saw them, and his description of their dances, arrows poisoned with Urari (strychnine), and characteristics sixty years ago are valuable anthropological documents.

He describes also the different types of vegetation in the Amazons: the Ygapós or inundation forest, with its trees whose trunks are "coated with dried slime" and its "dense bushes of a hard, cutting grass," the campos "carpeted with slender, hairy grasses, unfit for pasture, growing to a uniform height of about a foot," and "islands of jungle" or scattered trees, as well as the ordinary forest which prevails over an enormous area of the valley.

It will be seen that this classical work is one which should be included in every naturalist's library, and it is fortunate that it should now be published at a price which brings it within the reach of everyone.

Those who are specially interested in the author will find a short account of his life in the *Fortnightly Review*, December 1892, by Grant Allen; there is also the memoir by Edward Clodd in the 1893 edition of this work.

"A Book about Sweet Peas." By Walter P. Wright. 8vo., 168 pp. (Headley, London, 1909.) 2*s*. net.

Mr. Wright claims in his preface that he has made an earnest attempt in his book to show how much of interest, charm, and pleasure

lie in the Sweet Pea, while giving ample practical information as to its culture, and he has succeeded remarkably well in accomplishing the task he set himself. The numerous black and white illustrations are excellent, but we cannot say as much for the coloured plates, and Mr. Wright will be well advised to leave them out or get better ones for his next edition. To give an idea of the wide range of the book, we may note that it deals with the introduction of the Sweet Pea and its rise into public favour; the raising of plants; suitable soils and manures; best methods of planting and supporting; Sweet Peas for exhibition; Sweet Peas in the Colonies and in the United States of America; a sort of "Who's Who" in Sweet Pea culture, and a very full catalogue of varieties. There is also an excellent chapter on raising new varieties, explaining fully the correct method of cross-fertilization, and we are glad he endeavours to impress upon raisers of novelties the necessity for growing them for some years before attempting to dispose of them. Mr. Wright, like other sensible people, grieves that the country is being flooded with sorts which are dissimilar from existing varieties only in name. Few men are in a better position than Mr. Wright to write well about Sweet Peas, as he is Chairman of the Floral Committee of the National Sweet Pea Society. He has an excellent prose style, but he will never rank high as a poet!

"The Sweet Pea Annual, 1910." Edited by C. H. Curtis and H. J. Wright. 8vo., 120 pp. (Curtis, Brentford, 1910.) 2*s*.

The National Sweet Pea Society deserves great credit for the work it is doing in its trials, and the "Annual," in so far as it is a record of these trials, and embodies the decisions of its Floral Committee as to the best varieties in commerce, is invaluable. The 1910 edition is very different from its predecessors, and, while it may be quite as valuable to the expert, we are certain it will not be nearly so interesting to amateurs as previous issues have been. There is an absence of the "gossipy" or "chatty" articles which found a place in former years. The full report of the Conference held in London on December 10, 1909, occupies some thirteen pages. Mr. Cuthbertson's paper on "The Imperfect Seeding of Waved Sweet Peas" is enhanced by the reproduction of the photographs he used as illustrations. Mr. W. J. Unwin's paper on "Sweet Pea Names and Naming" is brief, but it contains one or two valuable suggestions. We agree with Mr. Unwin that a more detailed account of all fixed stocks might be given by the Society, but we cannot see why the Society should withhold information regarding the mixed stocks. Mr. Unwin says it is useless to waste time over them. That is exactly what many cultivators have to do, and it is just here the Society might help more than it does. About two-thirds of the stocks sent to the trials are impure. It is information about these the public wants, so as to avoid them. If the Society, however, only adopts Mr. Unwin's plan and publishes in full the names of all who send pure stocks, such will be helpful. Mr. Foster's note on the Reading Trials; Reports of Outings; Annual Report; Financial State-

ment, and the Official Catalogue of all known varieties of Sweet Peas, with their dates of introduction, prepared by Miss Jessie Cuthbertson, take up the bulk of the space, and altogether make, as we have already said, an invaluable handbook for the expert.

The full prize list of the London Show is material which we should hardly have considered important enough for incorporation in the "Annual." The frontispiece is an excellent portrait of Mr. N. N. Sherwood, who is President of the Society for 1910.

"Rose-Growing Made Easy." By E. T. Cook. 8vo., 204 pp. (*Country Life*, London, 1909.) 1*s*. net.

There is a great deal of interesting and practical information, obtained from various sources, scattered through the pages of this little Rose-book. In fact, there is scarcely any phase of rose culture which is not clearly and judiciously treated, while the varieties mentioned include not only some of the best of the older roses, but also many of those of the most recent introduction, so that this cheap and dainty little volume cannot fail to be welcomed by a large number of those amateurs who are in one way or another interested in the rose and its cultivation. The arrangement of the various subjects dealt with, however, leaves much to be desired, and cannot fail to be puzzling to the beginner. For instance, a good deal of the first chapter is taken up with the question of "Hybridization," the next treats of "Rose Dells," the third of "Roses for Decoration," the fourth of "Rose Soils," the fifth of the "Enemies of the Rose," and so on after the same irregular fashion throughout the book.

"Handbook of Flower Pollination." By Dr. Paul Knuth. Translated by J. R. Ainsworth Davis. Vol. III. (II. Band, II. Teil of German Edition). Observations on Flower Pollination made in Europe and the Arctic Regions on Species belonging to the Natural Orders *Goodenovieae* to *Cycadeae*. With 208 figures in the text, and a Systematic list of Insect Visitors, with the Names of the Plants visited. 8vo., 644 pp. (Clarendon Press, Oxford, 1909.) Cloth, 28*s*. net.

This volume is the continuation of the work already reviewed in the JOURNAL (xxxiv., September 1908, p. 114), and little can be added, save that it carries Dr. Knuth's very interesting and valuable observations on Flower Pollination to the end of the Dicotyledonous and Monocotyledonous Natural Orders.

In referring to Coniferæ (Gymnosperms), he lays stress on the fact already pointed out by Strasburger, that while these trees are anemophilous, and entirely independent of insect visitors, their cones often become bright red at the time of pollination. The red colouring must, therefore, be primarily a manifestation of increased vitality during anthesis, and we may suppose "that the analogous colouring of the perianth in angiospermous plants also owes its origin to a similar cause, and was only found to be of value and further evolved as the result of insect pollination later on."

This volume concludes with an alphabetical list of the insect and other visitors mentioned in vols. ii. and iii., with the names of the plants visited, and symbols to indicate the beneficial or harmful character of the visit.

"Hayward's Botanist's Pocket-Book." Revised by G. C. Druce, M.A., F.L.S. Ed. 13. Sm. 8vo., xliv. + 280 pp. (Bell, London, 1909.) 4*s*. 6*d*. net.

More than a generation of field botanists have found this little book a most useful companion on their rambles, serving to remind them of what to look for and to refresh their memories concerning the chief points of distinction between species. Much progress has been made since its first issue, and none has done more in aiding it than the reviser of the present issue. Further, the adoption of the "Vienna Rules" has led to the alteration of a considerable number of the names that were familiar to us in the older floras. These alterations are unfortunately necessary before finality can be reached, and it is to be hoped that all botanists will loyally accept the opinion of the Vienna Congress, although they may not think all its findings strictly logical. All the British species and their varieties are entered with the exception of those in "critical genera" such as *Rubus* and *Hieracium*, and for the difficult forms of these the botanist is referred to standard works. Indeed, no good purpose would have been served by giving brief descriptions of these critical forms, such as is given of all the other plants. The general plan of the older book is closely followed, the botanical and common names, habitat, colour, growth, duration, and time of flowering being arranged in columns on one page, and brief characteristics of species and varieties on the opposite one. The field botanist, whether a novice or a veteran, will find this an indispensable companion on his rambles. Its size is such that it will readily slip into the pocket.

"Gleanings from the Fields of Nature." By E. J. Connold, F.Z.S., F.E.S. 8vo., xvi.+270 pp. (Religious Tract Society, London, 1908.) 3*s*. 6*d*.

This is another of the books, now so numerous, designed to show what to see in country and seaside rambles. A variety of natural objects are drawn upon to form texts for the author's interesting notes, from the sea-urchin and the humble-bee to the primrose and the yew. The book is well got up and fairly free from technical words. The illustrations are particularly worthy of note, especially a beautiful photogravure of a fruiting shoot of yew; the primroses on plate 13, the oak on plate 22, and the mealy Guelder rose on plate 23 are also very pleasing.

"Fertilisers and Manures." By A. D. Hall, M.A., F.R.S. 8vo., 384 pp. (Murray, London, 1909.) 5*s*. net.

This book commences with a most lucid and interesting account of the early history of manures, giving due prominence to the important

work of Boussingault, Liebig, Lawes, and Gilbert. A general outline of the nutrition of plants is followed by the constituents of the soil, the mode of entry of the food into the plant, and the nature and function of a fertilizer. Fertilizers containing nitrogen are dealt with, giving due prominence to the manufacture of calcium cyanamide and nitrate of lime, with a discussion, in the former case, of its value as a manure.

On pages 36 and 37, with reference to nitrogen-fixing bacteria, are statements which will arouse controversy. Soil inoculation is dismissed in three and a half pages. We regret that such an important subject as nitrogen fixation and soil inoculation should have been so meagrely treated, and hope that this will be remedied in a future edition.

The rest of the book, dealing with the function and comparative value of nitrogenous manures, phosphatic manures, potassic fertilizers, farmyard manure, theories of fertilizer action, systems of manuring crops, the valuation and purchase of fertilizers, and the conduct of experiments with fertilizers, we read with profit and pleasure.

On p. 175 we notice a slight error in the text—"Similarly with the wheat (Table XXXV. p. 139)"; p. 139 should be p. 138. Again, on p. 61 the equation at the bottom of the page is wrong—we think through a misprint. It should read:

$$CaCO_3 + (NH_4)_2SO_4 = (NH_4)_2CO_3 + CaSO_4, \text{ and not } (N_4)_2CO_3.$$

On p. 69 "absorbant" should be "absorbent." These, no doubt, will be put right in future editions.

The publisher, on the whole, is to be congratulated upon such a technical work having so few errors. The print is easy to read, and the illustrations are quite a feature of the book.

"Radio-activity and Geology, an Account of the Influence of Radio-active Energy on Terrestrial History." By Professor J. Joly, M.A., D.Sc., F.R.S. 8vo., 287 pp. (Constable, London, 1909.) 7*s*. 6*d*. net.

This book is really an amplification of the author's presidential address to Section C at the meeting of the British Association in Dublin. This is a highly technical book, not of use to the horticultural student in general, but of great use to the advanced student in geology. In fact, the latter ought to buy it, as it is the most recent, authoritative, and lucid work he could get on the subject.

"Recent Advances in Physical and Inorganic Chemistry." By A. W. Stewart, D.Sc. With an Introduction by Sir Wm. Ramsay, K.C.B., F.R.S. 8vo., 267 pp. (Longmans, London, 1909.) 7*s*. 6*d*. net.

The scope of this work is sufficiently indicated by its title, and its authorship may be accepted as a guarantee of accuracy. The work consists of a series of essays dealing with a few of the more important developments of the subjects, and is a companion volume to the author's "Recent Advances in Organic Chemistry."

The student of chemistry, for whose special benefit these essays are written, will find that the essentials of much of the enormous amount of work which has been done within the past twenty years has been systematized and digested for him, so that he may be saved much labour in searching for information, and may have expert guidance as to what is likely to prove of value. There is little doubt but that the purpose, the success of which Sir William Ramsay anticipates (in his preface to the volume) will be fulfilled—namely, that the essays will prove of use in suggesting lines along which valuable rather than aimless research may be carried out.

With regard to treatment, many of the chapters, from the very nature of the work dealt with, can only appeal to students of chemistry, and the handling of these subjects is quite justified by this assumption. A few chapters—one especially dealing with recent attempts to "fix" the atmospheric nitrogen by a practicable method, and so make it available in the form of artificial manures—should prove of great interest to the horticulturist. The most involved chapter is probably that dealing with the *cobaltamines*, and, though rival theories are dealt with in all fairness and with but a reasonable amount of bias, it must be confessed that Dr. Stewart has not succeeded in making this essay very readable. This criticism, however, cannot be applied to any other portion of the work, which generally is most lucidly treated.

In such a volume as this one would expect to find some account of radio-activity and radio-active substances. These subjects are, indeed, dealt with, and in such a manner that, not only the student, but the reader with a fair knowledge of chemistry and physics can profit by a perusal of this part of the work. The author has confined his attention here to fact rather than theory, recognizing that the subject is still in its infancy, and that such explanations as are generally given are to be regarded as purely tentative.

"Plant Galls of Great Britain." By E. T. Connold, F.Z.S., F.E.S. 8vo., xii. + 292 pp. (Adlard, London, 1909.) 3*s*. 6*d*. net.

The author has given us two other books on British galls, and in the present one has combined much of the information contained in the other two. The great majority of the curious growths occurring on plants in Great Britain due to the punctures of insects or the attack of fungi are described and in most cases figured. The galls are arranged under the plants they attack, the latter being in alphabetical order.

Here and there we think the author is mistaken as to the origin of the gall, and in a few cases the "common" name of the plant is not widely used—*e.g. Lathyrus pratensis* is here called "wild pea"; but the book will prove very useful and interesting to the field naturalist.

It is rather a pity the author did not endeavour to make the list complete and use others' observations more liberally. The definition of "cambium" on p. 32 is out of date, and some of the names of fungi are inaccurate—*e.g. Puccinia fabae* should be *Uromyces fabae*.

"The Nature-Study Idea." By L. H. Bailey. Ed. 3. 8vo., lx. + 246 pp. (Macmillan, New York, 1909.) 4*s*. 6*d*. net.

Professor Bailey always writes inspiring books, and this is no exception to the rule. His plea for the introduction of nature-study into the educational system is a powerful one, and his manner of making it is, as usual, forcible and original.

The term "nature-study" has come to mean a more or less improved system of object-lesson teaching, which sometimes degenerates into an attempt "to enlarge the children's vocabulary" by making them learn a number of technical terms for which they feel no need, and which they will never actually need to use. The frequent result of this is to instil great respect for mere names and to generate that peculiar attitude of mind which, when a difficulty is met, gives it a high-sounding name and passes it by as overcome—that most unscientific attitude of mind that hinders progress and cramps the intellect.

Nature-study is not a subject, but a point of view—a method of education that puts the pupil into sympathy with his environment, to lead him to actually know and sympathize with nature and to quicken his senses and his brain. Nature-study is not science, but it makes an admirable introduction to habits of scientific thought and to an appreciation of healthy country occupations.

Not everyone who reads will accept all the author says, but to everyone who is interested in the true education of the quite young, Professor Bailey's book will give many a suggestion as to the methods best calculated to allow the full and natural development of the growing intellect of that most observing and inquiring of human creatures—the little child.

"A History of Gardening in England." By the Hon. Mrs. Evelyn Cecil (the Hon. Alicia Amherst), Citizen and Gardener of London. 3rd ed. 8vo., xviii. + 393 pp. (Murray, London, 1910.) 12*s*. net.

The first edition of this excellent "History of Gardening" was published at the close of 1895, and was quickly sold out, a second edition being published in 1896; and now a third edition has been called for, and in it the authoress pays a glowing tribute to the memory of her father, the late Lord Amherst of Hackney.

The "Amherst Library," lately dispersed, was known the world over, and but for the help of Lord Amherst and his famous library this book would never have been written. "Nearly all the rare gardening books quoted, Macer the 'Aggregator,' 'Ortus Sanitatis,' the works of Turner, Gerard, Parkinson, Tusser, Hill, and countless other writers" were her familiar friends from childhood; and the book is the result of living with these precious volumes.

Many persons collect old books, and a few may take the trouble to read them; but what is the use of knowledge unless it is used not only for the benefit of its possessor but for others as well?

The authoress has made abundant use of the knowledge she obtained through patient but withal pleasant work. The beginning of gardening in England was coeval with the Roman invasion. The Romans, doubtless, had well-stocked gardens attached to their houses. And as the Roman Empire crumbled, the outlying conquered provinces were deserted; and any plants or trees requiring careful cultivation perished from neglect during the stormy years which succeeded the Roman rule in Britain. As monasteries became established in the country a garden would be essential; and, doubtless, the monks introduced both vegetables and flowers from the Continent as early as the eleventh century. The authoress gives us a plan of an orchard and vineyard of the Monastery of Canterbury taken from a manuscript of 1165, but except for the knowledge that such a garden existed, we gain no information, and progress in any of the arts (except the art of war) must have been slow in those days. The careful details of the working of the monastic gardens down to the first decade of the sixteenth century is very interesting. In the account of the chapel garden, which belonged to the Bishop of Bath and Wells, we are told, "Three men were employed four and a half days digging and cleaning the chapel garden" at twopence per day.

Much interesting information is given concerning the laying-out and management of gardens about six or seven hundred years ago. In 1250 Henry III. improved the gardens at Woodstock for his Queen. High walls were built round the garden, and in 1252 orders were given to "turf the great herbarium." In 1260 alterations were carried out in the garden round Windsor Castle, and there is a record of wages paid. The King's gardener was paid a hundred shillings a year, and the labourers two and a half pence a day. There were also Royal gardens at Westminster, Charing, and the Tower.

Apple trees, pear trees, and vines were cultivated; the vine-dresser was classed with the gardener in many of the household accounts of the period preserved at the Record Office. In the fourteenth century many varieties of fruits and flowers were in cultivation. Chaucer in the "Romaunt of the Rose" gives the names of the following fruits as being cultivated in his time (he died at the age of seventy-two in 1400): Peaches, Quinces, Apples, Pears, Medlars, Plums, Cherries, Chestnuts, Nuts, "Aleis," the lote tree, the Bullace: and many trees are mentioned in the same passage. Grafting was well understood at this time, the Apple being grafted on Apple stock and Pear on the Hawthorn.

At a time that has in some respects been aptly termed the midnight of the dark ages in England, gardening flourished, and especial reference is made to the culture of the grape vine, and facing p. 22 there is an illustration of vine-pruners at work, taken from an Anglo-Saxon manuscript of the eleventh century, and the vine-dresser seemed to be quite as important an individual as the head gardener. If our climate has not greatly deteriorated, grapes of the Sweet Water and Muscadine kinds ought to be grown of good quality in well-placed

positions in the present day. We read that really good grapes were grown on walls in the king's garden for the use of the Royal table in the time of George III. Probably the cheapness of glass-houses, from which superior fruits can be obtained, is the cause of the decline of vine-growing in the open air.

It is impossible, nor is it desirable, to go into details of the history of gardening contained in this unique work. The early Tudor gardens are fully described; hundreds of books must have been consulted; and the matter has been arranged with the greatest care to bring out all the details of gardening in historical sequence. Gardening had taken a firm hold of the English people in the long reign of Queen Elizabeth; and progress was made in the reign of James I., for in the third year of his reign those practising the craft in and around London attained the dignified position of a Company of the City of London, incorporated by Royal Charter. In that year all those "persons inhabiting within the cittie of London and sixe miles compas thereof doe take upon them to use and practice the trade, crafte or misterie of gardening, planting, grafting, setting, sowing, cutting, arboring, kocking, mounting, covering, fencing, and removing of plants, herbes, seedes, fruit trees, stock sett, and of contryving the conveyances to the same belonging, were incorporated by the name of Master, Wardens, Assistants and Comynaltie of the Companie of Gardiners in London." The above is an extract from the original charter. Thomas Young was the first master. The formation of the Guild was, in the first instance, to stop sundry deceits and abuses that had crept into the dealings of the gardeners with their customers, such as selling dead trees, bad seeds, &c., and very drastic measures were taken to stop the frauds of these men. A second charter was granted in 1616; and the rights and privileges of the Company were confirmed by Charles I. in 1635.

The book ought to find a place in every garden library. The second edition has been in the reviewer's collection of gardening books since the year of its publication, and is often referred to. The introduction of the various important popular plants are alluded to, such as the Fuchsia, Dahlia, the first Orchids, &c.; and interesting as well as useful information is given concerning some of the plants introduced to this country. Kindly reference is made to the excellent work done by the Royal Horticultural Society in the early part of the nineteenth century; but it was not "John Wedgewood" but John Wedgwood, the son of Josiah Wedgwood, the eminent potter, who really suggested the formation of a Horticultural Society, and was the first treasurer.

The part of the book relating to nineteenth century gardening should be read and inwardly digested by all, whether practical gardeners or amateurs.

The bibliography of printed books on English gardening commences with "The Grete Herball," 1516, and ends with "The Floricultural Magazine," 1836. Some mistakes are inevitable, especially as regards dates, and volumes of periodicals. For instance, the "Floricultural

Cabinet and Florist's Magazine" is stated to be in 21 vols., and published in 1833-51. It was started in 1833, but was continued to 1858, and contains 26 volumes—at least the reviewer possesses 26 volumes—there may be more, but probably not, as "The Florist," started in 1849, had greatly superior coloured plates, and it may, indeed, have been the cause of the other's collapse.

"The Standard Cyclopedia of Modern Agriculture and Rural Economy." By many authors; edited by Professor R. Patrick Wright. 8vo., vols. iii. to vii., each 240-256 pp., with plates and figures. (The Gresham Publishing Company, London, 1908-9.) 8*s*. net each vol.

Seven volumes of this work, which has become so well known as to require but few comments, have now appeared. The many excellent figures and plates will ensure a large sale. As the number of volumes increases the need of an index becomes more and more apparent. The very large number of cross references is possibly unavoidable in a work arranged in this way, but readers do not care to have to look through several volumes, and probably in several places of some, before finding all they want.

There must necessarily be great diversity of opinion respecting the merits of this work, but all will find something to interest and instruct. If some of the articles had appeared in the periodic Press instead of book form, considerable attention would have been drawn to them, and doubtless much correspondence would have resulted.

Of special interest to gardeners are the articles written by Mr. W Watson, of Kew. The article on grasses by Mr. A. N. McAlpine in vol. vii. is of great merit.

"Stephens' Book of the Farm." Ed. 5. Revised and largely rewritten by James Macdonald. Vols. ii. and iii. 8vo., 550 pp. + plates. (Blackwood, London, 1908-9.) 21*s*. net each vol.

A well-known standard work which has been brought up to date. Farming rather than gardening matters are dealt with. Conciseness is a marked feature. Well written and well got up, it will still hold its own among many competitors. It will be appreciated by the student preparing for examination, and its value will be even better gauged by the experienced farmer who turns to it for help in the time of perplexity.

"Town Gardening." By B. C. Ravenscroft. Second Edition. 8vo., 337 pp. (Murray, London, 1910.) 2*s*. 6*d*. net.

There are comparatively few alterations or additions to this excellent and practical book as compared with the first edition, but the lists of plants have been brought up to date. All who possess a town garden should read this book, written by a man who has gained practical experience in a town garden.

"The Ideal Garden." By H. H. Thomas. 8vo., 276 pp. (Cassell, London, 1910.) 6*s*. net.

Mr. Thomas brings before our notice those plants which may be considered indispensable to our gardens, and many others that would also be considered indispensable if they were better known, including many wild flowers; but one plant, *Campanula rapunculoides*, mentioned by the author we should rigidly exclude from every garden, as, once established, it spreads so freely as to become a perfect pest, causing no end of labour to prevent it smothering everything else. There are also a few errors in spelling names, but no doubt these little mistakes will be corrected in the next edition. With these exceptions, the book is full of valuable hints on the best way to improve and make the garden beautiful for the greater portion of the year. The printing is bold, and the many illustrations are well done and add very much to the appearance and value of the book. At the end of the book is a most useful list of hardy plants, giving the popular and botanical names, the best varieties to grow, the colour of the flower, the height, the season of blooming, and excellent remarks on the plants themselves, such as the position they prefer, if free bloomers, &c., all of which is just the information most needed. A capital index concludes a very interesting book.

"Gardening Difficulties Solved." Edited by H. H. Thomas. 8vo. 160 pp. (Cassell, London, 1910.) 1*s*. net; cloth, 1*s*. 6*d*. net.

In this useful little book a careful selection of Questions and Answers from the columns of *The Gardener* have been collected and put together in book form. As all the questions have been actually asked, the answers will be of more than ordinary interest to the amateur gardener, for whom the book is intended. Almost every form of gardening, both under glass and outside, that would interest the amateur is clearly described, and we must compliment the author on his book, which is well indexed.

"Wells' Book on the Chrysanthemum." By W. Wells. 8vo. 4th Edition. 124 pp. (Wells, Merstham, 1910.) 1*s*. 6*d*. net.

From such a successful veteran-grower as the author we could scarcely expect anything but a thoroughly reliable and up-to-date book on this popular flower. It more than realizes one's expectations, and we can confidently recommend it to all Chrysanthemum growers. The book is not indexed, but any information required will be found under the heading of the chapters.

"Tomatoes and How to Grow Them." By R. F. Castle. 8vo., 100 pp. (Collingridge, London, 1910.) 1*s*. net.

A very practical little work by an experienced writer, dealing with the cultivation of the Tomato in all its phases, its diseases, enemies, manures, varieties; omitting little, if anything, one desires to know about this popular article of diet.

"Mushrooms and their Cultivation." By T. W. Sanders. 8vo., 80 pp. (Collingridge, London, 1909.) 1*s.* net.

This book on mushrooms and other edible fungi is specially written for amateurs, but even professional growers may gain much valuable information from its pages. It is a thoroughly practical work, and crammed from cover to cover with useful instruction of how a man with even the smallest garden may grow these delicious fungi. There is a good index.

"Agricultural Botany, Theoretical and Practical." By J. Percival, M.A., F.L.S. Ed. 4. 8vo., xiv. + 828 pp. (Duckworth, London, 1910.) 7*s.* 6*d.* net.

The fourth edition of this excellent text-book has been revised and some additions made, including a chapter on the Linaceae. By the excellence of its matter and the clearness of its arrangement this book long since commended itself alike to teacher and taught, and it well maintains its high position so that it may be regarded as indispensable to the horticultural and agricultural student.

"The Boy's Own Nature Book." By W. Percival Westell, F.L.S. With a chapter and numerous illustrations by the Rev. S. N. Sedgwick, M.A. 8vo., xvi. + 374 pp. (Religious Tract Society, London, 1908.) 3*s.* 6*d.*

This volume of rather discursive stories of animal and plant life will interest many a boy and girl in country sights and sounds. It is well illustrated from photographs, and though some are rather more curious than important, all add to the interest of the book. In addition to the illustrations in the text there are two folding plates in a pocket at the end of the book showing the caterpillars and chrysalides of British Butterflies and Moths and British Butterflies in colours, while two Appendices give annotated lists of these. Any boy with an embryonic love of nature would welcome this as a gift or prize we are sure.

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* "Annuals are such plants as in this country ordinarily begin and end their growth, ripen seed, and die (irrespective of frost) within twelve months" (R.H.S. Rules for Judging). Many plants enumerated here (as for example the first on the list) do not come within the Society's definition of true annuals, but as they were sent as such it is thought better to include them.

† All trials in the Wisley Garden are carried out under numbers only until judging is completed. The number prefixed to the name of the variety in the Report corresponds with that by which alone the variety was known until judgment had been given. Fellows visiting the Garden and noticing any plant under a number can easily ascertain its name later by reference to the Report in the JOURNAL.

2. (J. Veitch).—A. 6 inches, spreading; flowers in loose racemes, white.

4. Little Dorrit (J. Veitch).—A. Dwarf, compact; flowers white, very freely produced; stock requires more selection.

3. Little Dorrit (Barr).—A. Similar to above, but stock true.

5. Snow Carpet (Carter).—A. Very dwarf, 2 inches, compact; flowers white, very freely produced.

AMARANTHUS

567. *caudatus* (J. Veitch).—A. 1 foot, erect, branching; foliage green, tinged with purple; flowers in dense pendulous racemes, purple-maroon.

— *hypochondriacus* (Carter).—A. Failed to germinate.

558. *melancholicus ruber* (J. Veitch).—A. **XX.** July 23, 1861. 4 inches, erect; leaves and stems cardinal red.

— *salicifolius* (J. Veitch). — A. **F.C.C.** September 6, 1871. Failed to germinate.

ANTIRRHINUM

476 and 481. Butterfly (Carter).—P. 9 inches, erect, branched; flowers large, of mixed colours, freely produced.

484. Dwarf Fiery Red, Yellow Lip (Carter).—P. Failed to flower.

483. Dwarf Gloriosa (Carter).—P. Failed to flower.

479. Dwarf White (Carter).—P. Failed to germinate.

477. Dwarf Yellow (Carter).—P. 6 inches, erect, compact; flowers yellow.

482. Fiery Belt (Carter).—P. 9 inches, erect, branched; flowers large, orange, shaded with rose.

478. Lullingstone Castle Strain (Dyke).—P. 1 foot, erect, branched; flowers large, yellow and scarlet.

480. Mixed (Forbes).—P. 9 inches, erect, branched; flowers large, of mixed colours, chiefly shades of yellow.

475. Star Mixed (Carter).—P. Failed to flower.

ARCTOTIS

6 and 7. *grandis* (Barr, Carter).—A. **A.M.** July 16, 1901. 1¾ foot, erect, much branched; flowers 3 inches across; ray florets white, touched with lilac, with a prominent band of yellow near the raised mauve-coloured disc, and deeply stained with lilac on the reverse.

ARGEMONE

8. *grandiflora* (Barr). — P. 1¼ foot, erect, branched; leaves pinnatifid, prickly; flowers white, with conspicuous yellow anthers.

ASTER (*Callistephus hortensis*)

401. Blue Plume (Carter).—A. 6 inches, erect, compact; flowers double, violet-blue, freely produced.

405. Carmen (Barr).—A. 6 inches, erect, compact; flowers double, pink.

395. De Chine à grande fleur varié (Vilmorin).—A. 6 inches, bushy; flowers double, large, white, heliotrope, and violet-blue.

376. Empress Frederic (Barr).—A. 6 inches, erect, compact; flowers double, 3 inches across, white.

379. Germania (Barr).—A. 6 inches, erect, branched; flowers double, large, white tinged with pink.

416. Giant Comet Amethyst (Barr).—A. 9 inches, erect, compact; flowers large, 3 inches across, white tinged with purple.

381. Giant Comet Ruby (Barr).—A. Dwarf, 4 inches, erect, compact; flowers double, dark red.

402. Gitana à grande fleur varié (Vilmorin).—A. 6 inches, bushy; flowers double, mixed colours, freely produced.

410. Glorio (Barr).—A. Dwarf, 3 inches, compact; flowers small, white edged with red. Stock not quite true.

417. Hercules Giant White (Barr).—A. Dwarf, 4 inches, erect, compact; flowers double, 4 inches across, white.

403. Japanese Cardinal (J. Veitch).—A. Dwarf, 4 inches, erect, compact; flowers small, crimson with yellow centres.

388. July Ray (Barr).—A. 6 inches, erect, compact; flowers violet-purple, freely produced.

392. Mauve Queen (Barr).—A. 6 inches, erect, compact; flowers large, 4 inches across, white tinged with heliotrope.

391. Midsummer Extra Early (Carter).—A. 6 inches, erect; flowers double, 2 inches across, of mixed colours, freely produced.

372. Ostrich Feather Scarlet King (Barr).—A. 9 inches, erect, branching; flowers large, crimson-red.

394. Ostrich Feather Snowball (Barr).—A. 1 foot, erect, branched; flowers large, $3\frac{1}{2}$ to 4 inches across, white, freely produced; stock mixed.

389. Ostrich Feather Terra-Cotta (J. Veitch).—A. 9 inches, erect, compact; flowers double, 3 inches across, deep salmon-red fading to whitish-red at the tips.

407. Ostrich Feather Extra Early (Carter).—A. 6 inches, erect, compact; flowers 2 inches across, white, freely produced.

404. Ostrich Plume Improved White (Barr).—A. 6 inches, erect, branching; flowers double, 3 inches across, white, freely produced.

400. Ostrich Plume Brilliant Carmine (J. Veitch).—A. 6 inches, erect, branched; flowers double, crimson-red, freely produced.

373. Pink Pearl (Barr).—A. 1 foot, erect, compact; flowers large, shades of purple, red, and pink, freely produced.

409. Plume D'Autriche varié (Vilmorin).—A. $1\frac{1}{4}$ foot, erect and compact; flowers single, 3 inches across, mixed colours.

406. Pride of the Market Rose (Barr).—A. 6 inches, erect; flowers pink.

377. Queen Charlotte (Barr).—A. 9 inches, erect, compact; flowers double, white shaded with crimson.

374. Paeony-flowered Brilliant Rose (Carter).—A. 8 inches, erect, branched; flowers 2 inches across, crimson-red.

375. Ray Crimson (Carter).—A. 9 inches, erect, much branched; flowers double, crimson-purple.

385. Ray Crushed Strawberry (Carter).—A. 9 inches, erect; flowers 2 inches across, crimson fading to pink, freely produced.

387. Ray Dark Blue (Carter).—A. 9 inches, erect, branched; flowers 3 inches across, violet-blue.

382. Ray Fairy (J. Veitch).—A. 9 inches, erect, branched; flowers single, 2 inches across, heliotrope.

414. Ray Pure White (Carter).—A. Dwarf, 6 inches, erect; compact; flowers small, white.

384. Reine des Naines varié (Vilmorin).—A. 6 inches, straggly; flowers large, double, of mixed colours.

396. Rose Plume (Carter).—A. 3 to 6 inches, erect, compact; flowers 3 inches across, crimson, freely produced.

398. Salmon Queen (Barr).—A. 1 foot, erect, much branched; flowers 2½ inches across, salmon-pink, very freely produced.

411. Scarlet Queen (Barr).—A. 6 inches, erect, compact; flowers 2 inches across, scarlet, freely produced.

383. Mauve (J. Veitch).—A. 9 inches, erect, branched; flowers 2 inches across, deep mauve.

408. Single Comet Blue (Carter).—A. Dwarf, erect, compact; flowers single, 2 inches across, violet-blue.

413. Single Comet Rose (Carter).—A. 6 inches, scarcely branched; flowers pink and white; stock requires more selection.

420. Single Comet White (Carter).—A. 6 inches, compact; flowers single, 3 inches across, white with yellow disc; stock requires more selection to make habit constant.

397. Sunlight (Barr).—A. 6 inches, bushy, compact; flowers double, 1½ inches across, yellow, freely produced.

399. Unicum (Barr).—A. Similar to White Star.

419. Victoria Giant Rose (Barr).—A. 8 inches, erect, branched; flowers 3½ inches across, rose-pink tinged with white, freely produced.

418. Giant White (Barr).—A. Dwarf, 4 inches, compact; flowers 2 inches across, white.

415. Victoria mixed (Carter).—A. 9 inches, erect, branched; flowers large, of mixed colours.

380. Vieux Rose (Barr).—A. 9 inches, erect; flowers double, deep rosy red tinged with salmon.

390. White Star (R. Veitch).—A. 9 inches, erect, compact; flowers large, white; florets narrow.

BEGONIA

321. *gracilis*, Lumineux (Vilmorin).—P. Dwarf, 6 inches, erect; foliage greenish-purple; flowers single, red and yellow, freely produced in clusters.

319. *semperflorens*, *Erfordia grandiflora superba* improved (Pfitzer).—P. Very dwarf, erect; foliage greenish-purple; flowers single, rose-pink, freely produced in clusters.

317. *semperflorens*, Pfitzer's Triumph (Pfitzer).—P. Very dwarf, erect; flowers single, white, tinged with rose on reverse of petals, freely produced in clusters.

320. *semperflorens*, *Wurtembergia* (Pfitzer).—P. Dwarf, 6 inches, erect; foliage greenish-purple; flowers single, deep red, freely produced in clusters.

— Superb Prize Double (Sydenham).—P. Failed to germinate.

— Superb Prize Single (Sydenham).—P. Failed to germinate.

318. Salmon Queen (Sydenham).—P. Failed to flower.

BRACHYCOME (Swan River Daisy)

570. *iberidifolia* (J. Veitch).—A. 6 inches, procumbent; flowers composite, 1 inch across, dark blue with a yellowish-brown disc; very freely produced.

CALENDULA.

12. Cockade Orange (Carter).—A. 1 foot, erect, compact; flowers 3 inches across, double, deep orange, very freely produced.

13. *eriocarpa* (Barr).—A. 1½ foot, erect, compact; flowers single, 2 inches across, orange-yellow with a pale yellow zone near disc.

14. Orange King (Dobbie).—A. 10 inches, erect, bushy; flowers 2 inches across, reddish-orange with a greenish-brown centre.

15. Sulphur Queen (Dobbie).—A. 1 foot, erect; flowers double, 2 inches across, yellow with greenish centre, freely produced.

CALLIOPSIS. See COREOPSIS.

CAMPANULA

62. *macrostyla* (Barr).—A. **XXX.** 1889. 1½ foot, lower leaves ovate-oblong, upper ovate-lanceolate, whole plant hispid; flowers purple, netted with violet.

CANDYTUFT (*Iberis*)

16. Dobbie's Crimson (Dobbie).—A. 1 foot, inclined to be straggly; flowers purplish-violet, borne on vigorous showy spikes.

17. Empress Compact (Carter).—A. 8 inches, very neat and compact; flowers white, in dense pyramidal spikes, freely produced; the best white candytuft in the trial.

18. Empress White (Nutting).—A. 1 foot, much branched; flowers large, white.

19. Giant White Improved (Barr).—A. 1 foot; flowers white, in corymbs.

20. Hyacinth-flowered (Carter).—A. Similar to Empress White.

21. Little Prince (Barr).—A. 8 inches, much branched, spreading; flowers small, white, freely produced.

22. Little Prince (Nutting).—A. More compact than the last.

23. Dwarf Rose-flowered (J. Veitch).—A. 1 foot, bushy; flowers pink, freely produced in flat heads.

24. Dwarf Mixed (J. Veitch).—A. 1 foot, bushy; flowers various shades of crimson, vigorous spikes.

25. Pigmy (Carter).—A. 6 inches, semi-procumbent; flowers white, freely produced in dense pyramidal spikes.

26. Rose Cardinal (Dobbie).—A. 1½ foot, straggly; flowers rosy-purple, freely produced.

28. Rose Cardinal (Carter).—A. **A.M.** July 16th, 1901. Similar to the last, but plants more bushy and free flowering.

29. Rose Cardinal Improved (Barr).—A. Same as No. 28.

27. Rosy Dawn (Barr).—A. 1¼ foot, compact; flowers white tinged with pink, freely produced.

30. White Spiral (Dobbie).—A. **XXX.** July 9th, 1889. 1 foot, much branched; flowers large, white, borne in long dense spikes.

CARNATION

598. New Annual (Carter).—P. Did not flower well.

CELOSIA

554. Crimson Shades (Carter).—A. 1 foot, fastigiately branched; foliage deep crimson; inflorescence plumose, crimson.

550. *cristata pyramidalis var.* (Vilmorin).—A. 1 foot, erect; foliage green shaded with red; inflorescence loose, orange-red.

556. Glasgow Prize (Sydenham).—A. 6 inches; foliage green.

557. Golden Shades (Carter).—A. 8 inches, erect; foliage yellowish-green; inflorescence loose, golden.

555. Golden Yellow (Barr).—A. 1 foot, erect, fastigiate; foliage green; inflorescence loose, golden.

552. Improved Feathered (Barr).—A. 6 inches; foliage cardinal red; inflorescence bright red.

551. New Dwarf Feathered (Barr).—A. 1 foot; foliage green tinted with orange; inflorescence reddish-purple; stock requires more selection.

549. *pyramidalis*, Mixed (Sydenham).—A. Owing to the damp season, did not do well.

553. Rainbow (Carter).—A. Germinated badly.

CENTAUREA

31B, 32. *depressa*, The Queen (Barr, J. Veitch).—P. Dwarf, 4 inches, straggly; leaves sessile and lanceolate; flowers small, blue.

283. *moschata*, Bridesmaid (Barr).—A. 9 inches, straggly; flowers pale yellow.

284. *moschata*, Honeymoon (Barr).—A. 9 inches, erect, compact; flowers lemon-yellow, freely produced.

285. *moschata*, The Bride (Barr).— A. 1 foot, straggly; flowers white.

286. *moschata*, The Bridegroom (Barr).—A. 1 foot, straggly; flowers purplish crimson.

287. *moschata*, Giant Mauve, White Centre (Carter).—A. 1½ foot, straggly; flowers purplish-crimson.

288. *moschata*, Giant Mauve (Carter).—A. 1 foot, straggly; flowers purplish-crimson.

289. *moschata*, Giant White (Carter).—A. 1¼ foot, straggly; flowers deep crimson.

290. *moschata*, Giant White (Carter).—A. 9 inches, straggly; flowers double, white.

291. *moschata*, Giant Yellow (Carter).—A. 8 inches, more bushy than the last; flowers small, yellow.

292. *moschata*, Mixed (Carter).—A. 9 inches, straggly; flowers double, large, of mixed colours.

CERINTHE

33. *alpina* (Edinburgh Bot. Gardens).—Failed entirely.

34. *longifolia* (Edinburgh Bot. Gardens).—Failed entirely.

CHEIRANTHUS

45. *annuus var.* (Vilmorin).—Failed to flower.

46. *annus grandiflorus var.* (Vilmorin).—Wrongly named.

CHRYSANTHEMUM

47. Bridal Robe (Carter).—A. Failed.

48. *carinatum*, Evening Star (Barr).—A. 1¼ foot, straggly; flowers 2 inches across, yellow, very freely produced.

49. *carinatum*, Lord Beaconsfield (Carter).—A. 1½ foot, straggly, foliage much cut; flowers white with crimson and yellow base to petals, maroon disc.

50, 51. *carinatum*, Morning Star (Barr, Carter).—A. 1 foot, straggly; flowers 2 inches across, light yellow, freely produced.

52. *carinatum*, Northern Star (Barr).—A. **XXX.** July 29, 1909; 10 inches, bushy; flowers 3 inches across, white with zone of yellow at base, sepia disc, freely produced.

53, 54. *carinatum*, Silver Queen (Barr, J. Veitch).—A. 1¼ foot, bushy; foliage finely cut; flowers white with yellow zone at base, and centre green, tinged with yellow.

55. *coronarium*, Golden Gem (Barr).—A. 1½ foot, bushy, compact; flowers 1 inch across, yellow. Stock requires more selection.

56. *coronarium fl. pl.*, White Pearl (Barr).—A. 1½ foot, compact; flowers white, very freely produced.

586. Early-flowering Single (J. Veitch).—P. Failed to flower.

57. *segetum album* (Roemer).—A. Failed to germinate.

58. *segetum*, Etoile d'Or (Vilmorin).—A. 9 inches, straggly; flowers yellow, very freely produced.

59. *segetum*, Little Gem (Barr).—A. Similar to the last.

CLARKIA

35, 36. *elegans fl. pl.*, Brilliant (Nutting and J. Veitch).—A. 2 feet, erect, bushy; flowers double, crimson, borne in spikes 1 foot long.

37. *elegans fl. pl.*, Brilliant (Barr).—A. 2 feet, bushy; flowers double, salmon-pink, very freely produced.

38. *elegans*, New Blotched (Carter).—A. 2½ feet, bushy, compact; flowers single, salmon-pink spotted with red at edges of petals, freely produced.

39. *elegans fl. pl.*, Rose Beauty (Barr).—A. 3 feet, bushy, flowers double, deep rose, freely produced on spikes 1½ foot long.

40, 41, 42. *elegans*, Salmon Queen (Carter, Barr, J. Veitch).—A. **F.C.C.** July 7, 1875; 3 feet, bushy; flowers deep salmon-pink, in long spikes, freely produced.

43. *elegans*, White Queen (Barr).—A. 3 feet, bushy; flowers white.

44. *pulcherrima* (Barr).—A. 1½ foot, erect, very bushy; flowers rosy-crimson, freely produced. The earliest Clarkia.

COLEUS

609. Cuivré à Grande Feuillage (Vilmorin).—P. Of good habit; foliage including many pleasant shades of brown, yellow, and purple.

610. Choicest Hybrids (Sydenham).—P. A nice selection of good colours.

COLLINSIA

60. *bicolor* (Dobbie).—A. 9 inches, erect, compact; flowers white tinged with purple, borne in whorls.

CONVOLVULUS

61. *unicaulis*, Crimson Beauty (Barr).—A. Dwarf, 4 inches, compact; flowers 1 inch across, reddish-purple.

COREOPSIS

523. Dwarf Crimson (Carter).—A. 1¼ foot, erect, much branched; flowers yellow and deep crimson, freely produced; requires more selection.

526. Dwarf Crimson and Gold (Carter).—A. 1 foot, erect, bushy; flowers yellow striped with crimson, freely produced.

525. Miniature Crimson Marbled (Carter).—A. 1 foot, erect, compact; flowers red and yellow marbled, with a few selfs, freely produced.

527. Miniature Crimson and Gold (Carter).—A. Dwarf; flowers yellow and brown in varying degrees. Stock requires more selection.

522. Tall Crimson (Carter).—A. Failed to germinate.

528. Tall Crimson and Gold (Carter).—A. Tall, 2½ feet, much branched; flowers small, deep crimson.

524 and 529. Tom Thumb Beauty (Barr, J. Veitch).—A. 1 foot, erect, bushy; flowers yellow and crimson, very freely produced.

531. Tom Thumb Crimson King (Barr).—A. Failed.

530. Tiger Star (Barr).—A. 9 inches, erect; flowers crimson and yellow, freely produced.

COSMOS

587. *diversifolius* (Barr).—P. 1 foot, straggly; foliage much cut; flowers yellow with a greenish disc.

595. Early-Flowering (Sydenham).—P. Tall, 3½ feet, spreading; flowers few, 2½ inches across, heliotrope.

588. Early Dawn (Barr).—P. 1½ foot, bushy, compact; foliage finely cut; flowers few, white.

589. Early Large-Flowering Crimson (J. Veitch).—P. 2 feet, straggly; flowers single, dark crimson, freely produced.

592, 593. Early-Flowering Mixed (Carter).—P. Tall, 3 feet, spreading; flowers few, 3 inches across, of mixed colours.

591. *hybridus grandiflorus albus* (Roemer).—P. 2 feet, much branched; flowers 3 inches across, pure white.

597. *hybridus grandiflorus*, Delicate Rose (Roemer).—P. 1½ foot, straggly; flowers single, white tinged with rose.

—. *hybridus grandiflorus Kermesinus* (Roemer).—P. Failed to germinate.

596. *hybridus grandiflorus purpureus* (Roemer).—P. 2 feet, inclined to be straggly; flowers 2 inches across, deep reddish purple.

590. *hybridus grandiflorus roseus* (Roemer).—P. 2 feet, straggly; flowers 2 inches across, rose, freely produced.

DAHLIA

612. Double (Pfitzer).—P. 3 feet, bushy; flowers single, 5 inches across, of mixed colours.

613. Finest Double (Carter).—P. 2½ feet, much branched; flowers double, of mixed colours.

DELPHINIUM (see also LARKSPUR).

607, 608. Blue Butterfly (Carter, Dobbie).—A. **A.M.** July 17, 1900. Failed to flower.

DIANTHUS

293. *barbatus*, New Annual Mixed (Barr).—P. Failed to flower.

426. Count Kerchove (Barr).—A. 8 inches, much branched; flowers semi-double, crimson with deeper markings, freely produced.

430. Crimson Belle (Carter).—A. Failed to flower.

432. Double Mixed (Carter).—A. 8 inches, erect, branched; flowers double, 2 inches across, of mixed colours, freely produced.

421. Harlequin (Barr).—A. 9 inches, spreading; flowers 2 inches across, white splashed with crimson.

435. *Heddewigii*, Empress (Barr).—A. 6 inches, branched; flowers 2 inches across, single, deep crimson, freely produced.

437. *Heddewigii*, Choice Double Mixed (Barr).—A. 9 inches, erect, branched; flowers semi-double, crimson, with deeper markings, freely produced.

431. *Heddewigii*, Deeply-Fringed (Barr).—A. Failed to germinate.

423. *Heddewigii*, Princess Pinks (Barr).—A. 8 inches, erect, branched; flowers single, 1½ inch across, rosy-magenta with crimson markings.

422. *Heddewigii*, Royal Pinks (Barr).—A. 9 inches, bushy; flowers large, single, chiefly of red and purple shades.

428. *Heddewigii superbissimus* (Barr).—A. 1 foot, compact; flowers single, 2½ inches across, crimson, freely produced.

429. Japanese Feather (Carter).—A. 9 inches, erect, branched; flowers single, 3 inches across, freely produced.

440. Mephisto (new fringed) (Barr).—A. Failed.

436. Rosalind (Barr).—A. 8 inches; flowers double, white with reddish brown markings, freely produced.

424. *chinensis* var. (Vilmorin).—B. 10 inches, erect, branched; flowers 2½ inches across, single, crimson, shading paler towards the edge, freely produced.

425. *chinensis fl. pl.* var. (Vilmorin).—B. 8 inches, spreading; flowers double, of mixed colours, freely produced.

438. Silver Lace (Carter).—A. Failed.

434. Salmon Queen (Carter).—A. 6 inches, erect, branched; flowers single, 1½ inch across, rosy pink, freely produced.

439, 441. Vesuvius (Carter).—A. 6 inches, erect, branched; flowers single, 1½ inch across, bright red.

DIASCIA

574, 602. *Barberae* (Vilmorin, Barr).—A. Failed to flower satisfactorily.

—. *Barberae hybrida* (Barr).—A. Failed to germinate.

DIMORPHOTHECA

575, 576. *aurantiaca* (Barr, J. Veitch).—P. **A.M.** May 26, 1908. 9 inches, spreading; flowers 2½ inches across, orange-yellow with brown disc, freely produced.

577. *Ecklonis* (Barr).—P. Strong plants were produced but no flowers.

DOWNINGIA

573. *elegans* (J. Veitch).—A. 6 inches, procumbent; flowers blue with a cream spot on lower petals.

572. *pulchella* (J. Veitch).—A. 6 inches, procumbent, flowers blue, yellow centres.

ERYSIMUM

63. *Perofskianum* (Barr).—A. **XXX.** July 9, 1889. 1½ foot, compact, branched; flowers orange, ½ inch across, borne in spikes about 9 inches long.

64. Golden Gem (J. Veitch).—A. Failed to flower.

ESCHSCHOLZIA

71. *californica*, Golden West (Barr).—A. 1½ foot, very spreading; flowers 1½ inch across, yellow with orange zone at base of petals, freely produced.

72. *californica*, Orange Queen (Barr).—A. 1 foot, bushy; flowers double and single, orange yellow, freely produced. Stock requires more selection.

65. Carmine King (Carter).—A. **A.M.** July 4, 1905. 9 inches, erect, bushy; flowers rich carmine, very freely produced.

66. Diana (Carter).—A. 9 inches, branched; flowers cream tinged with crimson outside, freely produced.

67, 68, 69. Dainty Queen (Barr, Carter, J. Veitch).—A. 9 inches, branched; flowers pale salmon pink, freely produced.

70. Double (Carter).—A. Similar to No. 72 in all respects.

73. *erecta*, Mandarin Improved (Barr).—A. 1 foot, bushy; flowers single, 1½ inch across, orange yellow, freely produced.

78, 79, 80. *erecta compacta*, Mandarin (Carter, Dobbie, J. Veitch).—A. **F.C.C.** July 3, 1877. 10 inches, erect, branched; flowers orange tinged with rose, freely produced.

74. *erecta*, Pink Beauty (Barr).—A. 1 foot, straggly; flowers small, pink tinged with pale crimson on outside.

75. *erecta*, Rose Queen (Barr).—A. 9 inches, branched, bushy; flowers crimson, freely produced.

76. *erecta*, Rosy Dawn (Barr).—A. 9 inches, erect, branched; flowers crimson, freely produced.

77. *grandiflora rosea* (J. Veitch).—A. 9 inches, erect, branched; flowers crimson, freely produced.

81. The Mikado (J. Veitch).—A. **A.M.** June 23, 1908. 9 inches, erect, compact; flowers orange-red shaded with bronze.

82. New Mikado (Carter).—A. Same as No. 81.

GAILLARDIA

511. Double Mixed (Carter).—P. Failed to flower satisfactorily.

510. Choice Mixed Single (Carter).—P. Failed to flower satisfactorily.

513. *picta Lorenziana fl. pl.* (Vilmorin).—P. Failed to flower well.

512. Compact strain (R. Veitch).—P. Failed to flower well.

GILIA

112. *dichotoma* (J. Veitch).—A. Failed entirely.

113. *nivalis*, Snow Queen (Barr).—A. 9 inches, foliage finely cut; flowers ½ inch across, purple with white spot.

GODETIA (=OENOTHERA)

83. Crimson Gem (Barr).—A. 1 foot, much branched; flowers single, heliotrope with dark crimson edge, very freely produced.

84, 85. Crimson Glow (Barr, J. Veitch).—A. 9 inches, bushy; flowers single, white edged with rose, freely produced.

86. Double Pink (Carter).—A. 1 foot, much branched; flowers double, salmon pink, freely produced.

87, 106. Duchess of Albany (Carter, Dobbie).—A. **F.C.C.** July 11, 1882. 1¼ foot, erect, branched; flowers single, cream faintly spotted with pink, freely produced.

88. Duke of York (Barr).—A. 1 foot, compact; flowers single, crimson and white.

89. Dwarf Crimson (Gloriosa) (Carter).—A. **A.M.** July 27, 1897. 1 foot, bushy, compact; flowers rosy purple with heliotrope centre, very freely produced.

90. Dwarf Deep Rose Pink (Lady Satin rose) (Carter).—A. 1 foot, erect, compact; flowers rose carmine.

91. General Gordon (Barr).—A. 1¼ foot, inclined to be straggly; flowers single, deep crimson with pink centre.

92. La Belle (J. Veitch).—A. **XXX.** July 27, 1898. 1¼ foot, compact, flowers single, large rose-carmine with pinkish white centre, very freely produced.

93, 104. Lady Albemarle (Carter, Nutting).—A. **F.C.C.** August 2, 1876. 1¼ foot, erect, branched; flowers single, deep crimson, very freely produced.

94. Malmaison (Barr).—A. 2½ feet, erect, branched; flowers single, pale salmon-pink.

95, 96. Marchioness of Salisbury (Barr, Dobbie).—A. **A.M.** July 5, 1895. 1 foot, bushy; flowers single, white with rose-pink centre, very freely produced.

97. Miniature Crimson (Carter).—A. 8 inches; flowers small, single, crimson, very freely produced.

98. Choice Mixed (Carter).—A. 1 foot, erect, branched; flowers large, of mixed colours, very freely produced.

99, 100. Rosamond (Carter, Nutting).—A. 1 foot, erect, branched; flowers rose-pink, freely produced.

101, 102, 103. *Schamani fl. pl.* (Barr, Dobbie, R. Veitch).—A. **A.M.** August 29, 1905. 1¼ foot, loosely branched; flowers semi-double, pale salmon-pink.

105. Tall Spotted Bridesmaid (Carter).—A. 1¼ foot, much branched; flowers in dense heads, rose-pink.

107, 108. Sunset (Nutting, J. Veitch).—A. 1 foot, bushy; flowers crimson, freely produced.

109. White Gem (Barr).—A. 1¼ foot, much branched; flowers crimson with rose centre, freely produced.

110. *Whitneyi compacta*, Brilliant (Barr).—A. **XXX.** July 27, 1898. 1 foot, compact; flowers rosy-pink, freely produced.

111. *Whitneyi*, Red (J. Veitch).—A. 1 foot, compact, much branched; flowers dark crimson, freely produced.

GYPSOPHILA

114, 115, 116. *elegans carminea* (Nutting, Barr, Roemer).—A. **XXX.** July 29, 1909. 9 inches, straggly, branched from the base; flowers small, rose.

117. White Pearl (Barr).—A. **XXX.** July 29, 1909. 1 foot, much branched; flowers large, pure white, freely produced.

HELIANTHUS

118. *cucumerifolius*, Mars (Barr).—A. 3 feet, erect, bushy; large foliage, ovate lanceolate; flowers single, yellow with sepia-brown centre.

111. *cucumerifolius*, Perkeo (Barr).—A. 2 feet, bushy; flowers single, 2 inches across, orange with sepia-brown centre.

120. *cucumerifolius*, Princess Ida (Barr).—A. 3 feet, bushy; flowers large, single, sulphur-yellow with greenish-yellow centre.

121. Miniature Double (Barr).—A. 3½ feet; flowers large, 3½ inches across, double, pale straw-yellow.

122. Miniature Venus (Barr).—A. 3 feet, branched; large foliage; flowers large, 3 inches across, pale sulphur-yellow, with sepia centre.

123. Miniature Flowered (Carter).—A. 3 feet, branched; large hairy foliage; flowers large, deep yellow with brown centre, freely produced.

124. Orion (Carter).—A. 3 feet, erect, branched; small foliage; flowers deep yellow with sepia centres, freely produced.

125. Stella (Carter).—A. 3 feet, erect, bushy; small foliage; flowers small, deep yellow with sepia centre, freely produced.

HELICHRYSUM (Everlasting Flowers)

515. Fireball (Carter).—A. Failed.

514. Silverball (Carter).—A. 1 foot, erect; flowers 2 inches across, white, freely produced.

HELIOTROPIUM

604. Frau Medizinal Rat Lederle (Pfitzer).—P. Failed.

HELIPTERUM (=RHODANTHE)

569. *Manglesii* (Barr).—A. 1¼ foot, erect, branched; flowers white tinged with crimson in centre, very freely produced.

568. *Manglesii alba* (Barr).—A. A pure white form of No. 569.

HOLLYHOCK (*Althaea rosea*)

616. New Perpetual Flowering (Carter).—P. Did not flower.

615. Chater's Prize Double (Sydenham).—P. Did not flower.

HUNNEMANNIA

605. *fumariaefolia* (J. Veitch).—P. **A.M.** August 23, 1898. Did not flower.

ICE PLANT (*Mesembryanthemum crystallinum*)

564. (Barr).—A. 6 inches, procumbent; leaves orbicular, undulate, glandular, succulent; did not flower.

IMPATIENS

578. *Balsamina fl. pl.* (Vilmorin).—A. 9 inches, erect, branched; flowers double, mixed colours, freely produced.

579. Challenge Prize Mixed (Carter).—A. 9 inches, erect, branched; flowers double, mixed colours, freely produced.

581. *Holstii hybrida* (Vilmorin).—P. Did not flower.

580. Rose Queen (Carter).—A. 9 inches, erect, branched; flowers double, soft-pink, freely produced.

KOCHIA

—. *trichophylla* (Carter, Vilmorin).—A. **F.C.C.** September 10, 1901. See *Journal R.H.S.*, XXVI., p. clxxxiii. Failed to germinate.

LANTANA

—. Finest French (Carter).—P. Failed to germinate.

—. Dwarf Mixed (Carter).—P. Failed to germinate.

LARKSPUR (*Delphinium, q.v.*)

126. Dwarf Bedding Dark Blue (Carter).—A. **XXX.** July 29, 1909. 1¼ foot, erect; flowers single, purple, in pyramidal spikes 8 inches long.

127. Dwarf Bedding Deep Pink (Carter).—A. **XXX.** July 29, 1909. 1¼ foot, erect; flowers single, rose-pink, in pyramidal spikes 9 inches long.

128. Dwarf Bedding Light Blue (Carter).—A. 1 foot, erect; flowers pale lilac blue, in spikes 4 to 8 inches long.

129. Dwarf Bedding Mauve (Carter).—A. 1 foot, erect, vigorous; flowers mauve, freely produced in spikes 8 inches long.

130. Dwarf Bedding Rose (Carter).—A. 1¼ foot, erect; flowers pink, in spikes 6 inches long.

131. Dwarf Bedding White (Carter).—A. 1¼ foot, erect, compact; flowers white, in spikes 8 inches long.

132. Dwarf Double Emperor Mixed (Barr).—A. 2 feet, erect, vigorous, much branched; flowers of mixed colours.

133. Dwarf Double Hyacinth-flowered Mixed (Barr).—A. 1¼ foot, compact; flowers of mixed colours, similar to No. 132.

134. Dwarf Double Stock-flowered Mixed (Barr).—A. 1¼ foot, erect, compact; flowers of mixed colours.

135. Empress Carmine (J. Veitch).—A. **A.M.** September 6, 1907. Tall, compact; foliage finely cut, flowers carmine-rose, in crowded spikes.

136. Tall Double-branching Mixed (Barr).—A. 3 feet, branched; flowers of mixed colours, freely produced.

137. Tall Double Hyacinth-flowered Mixed (Barr).—A. 3 feet; flowers of mixed colours, freely produced, in spikes 6 to 10 inches long.

138. Tall Double Stock-flowered Mixed (Barr).—A. 3 feet, spreading; flowers of mixed colours.

139. Tall Double Stock-flowered Rosy Scarlet (Barr).—A. Similar to No. 135 but not such a good strain.

LASTHENIA

142. *glabrata* (Barr).—A. 8 inches, semi-procumbent, flowers small, yellow, very freely produced.

LAVATERA

143, 144. *splendens alba* (Barr, J. Veitch).—A. 3 feet, erect, branched; flowers white, freely produced.

145, 146, 147. *splendens rosea* (Barr, Nutting, J. Veitch).—A. 3 feet, erect, branched; flowers 2 inches across, rosy-pink, freely produced.

LEPTOSIPHON

148. *androsaceus albus* (Barr).—A. 8 inches, erect, procumbent; flowers ¼ inch across, pale greenish-yellow, freely borne in terminal clusters.

149. *densiflorus* (Barr).—A. 1 foot, spreading; flowers ¾ inch across, heliotrope with yellow centre.

150. *hybridus* (Barr).—A. 6 inches, compact; flowers ¼ inch across, of various shades of red and yellow.

LIMNANTHES

151. *Douglasii* (J. Veitch).—A. 6 inches, procumbent, much branched; flowers yellow edged with white, freely produced. Much frequented by bees.

152. *Douglasii grandiflora* (Barr). A. **XXX**. July 9, 1889. Similar to No. 151.

LINARIA

155. *aparinoides* (J. Veitch).—A. 2 feet; flowers yellow, freely borne in loose racemes.

156. *bipartita splendida* (J. Veitch).—A. **XX**. July 26, 1860. 1¼ foot; flowers purple.

157. *maroccana alba* (J. Veitch).—A. 1¼ foot, erect, bushy; flowers white tinged with yellow at throat, very freely produced.

158, 159, 160. *maroccana*, Excelsior (Barr, Dobbie, J. Veitch).—A. Same as No. 157, but flowers of rose, red and purple shades.

161. *maroccana*, Queen of Roses (Barr).—A. Same as No. 158, but calyx glandular-hairy and flowers crimson.

162. *maroccana*, White Pearl (Barr).—A. Same as No. 157, but not so free-flowering.

163, 164. *reticulata aurea purpurea* (Barr, J. Veitch).—A. **XXX**. July 9, 1889. 1 foot; flowers crimson with yellow lip netted with crimson.

LINUM

153. *grandiflorum coccineum* (Barr).—A. **XX**. July 9, 1889. 1 foot, much branched; flowers 1 inch across, strawberry-red with a zone of brown at base of petals, very freely produced.

154. *grandiflorum rubrum* (Dobbie).—A. Same as No. 153, but not so free-flowering.

LOBELIA

309. *Erinus*, Barnard's Perpetual Flowering (Barr).—P. **A.M.** May 25, 1892. 6 inches, bushy; flowers deep blue with white eye, freely produced.

311. *Erinus compacta*, Belle de Moray (Barr).—P. 4 inches, very compact; foliage pale green; flowers light blue with white eye, freely produced.

308. *Erinus compacta*, Crystal Palace var. (Barr).—P. 4 inches, compact; foliage dark purplish-green; flowers deep blue. Stock requires more selection.

312. *Erinus pumila*, Oxonian (Barr).—P. 4 inches, compact; foliage pale green; flowers dark blue with white eye, freely produced.

306. Emperor William (Carter).—P. 4 inches, compact; flowers pale sky-blue.

316. *heterophylla atro-violacea* (Barr).—P. 4 inches, compact; foliage much cut; flowers blue with white eye, freely produced.

307. Dark Compact (Carter).—P. 4 inches, compact; foliage purplish-green; flowers sky-blue.

310. Light Compact (Carter).—P. 4 inches, compact; flowers light blue, freely produced.

313. Prima Donna (Carter).—P. 3 inches, compact; foliage dark green; flowers crimson and pale rose, freely produced.

314. *ramosa* (Vilmorin).—P. 3 inches, much branched; flowers mixed shades of blue, not freely produced.

LUPINUS

165. *Cruikshankii hybridus* (Vilmorin).—A. 2½ feet, erect, branched; flowers in spikes 18 inches long, standards dark blue with yellow base, freely produced.

166. *hybridus atrococcineus* (J. Veitch).—A. **XXX.** July 29, 1909. 2½ feet; flowers in spikes 8 inches long, standards crimson on opening, becoming darker, freely produced.

167. *mutabilis Cruikshankii* (J. Veitch).—A. 2½ feet, erect, much branched; flowers in spikes 10 inches long, white or heliotrope with yellow centre to wings.

168. *subcarnosus* (J. Veitch).—P. 9 inches, much branched; flowers in spikes 4 inches long, blue shaded with yellow, freely produced.

169. *tricolor elegans* (J. Veitch).—A. 18 inches, failed to flower.

MALOPE

172. Crimson (Dobbie).—A. 3 feet, much branched; flowers 1½ inch across, crimson.

170. Pink Domino (Carter).—A. 2½ feet, much branched; flowers large, pink, freely produced.

171. White Lady (Carter).—A. 3 feet, much branched; flowers 1½ inch across, white, freely produced.

MIGNONETTE

186A. Beauty of Stuttgart (Pfitzer).—A. 6 inches, inclined to be straggly; flowers green with red stamens.

173. Bismarck (Nutting).—A. 4 inches, erect, compact; flowers greenish-white with red anthers.

174. Covent Garden Favourite (Barr).—A. **XXX.** July 9, 1889. 6-8 inches, erect, compact; flowers greenish with red anthers.

175, 176. Golden Queen (Barr, Dobbie).—A. **F.C.C.** July 7, 1882. 6 inches, erect, bushy; flowers orange-yellow, very freely produced.

177. Goliath (Nutting).—A. 6 inches, erect, compact; flowers brownish-red, freely produced.

178. Machet Improved (Barr).—A. 6 inches, branched; flowers greenish-white with red anthers.

179. Machet White Pearl (Barr).—A. 4 inches, erect, branched; flowers greenish-white with red anthers.

180. New Red (Barr).—A. 6 inches, branched; flowers brownish-red.

181. Nineteen Hundred (Barr).—A. 6 inches, erect, bushy; flowers yellowish-green with red anthers.

182. Orange Queen (Barr).—A. 4 inches, erect, branched; flowers deep red.

183. Perfection (Carter).—A. 6 inches, branched; flowers deep brownish-red.

184. Red King (Carter).—A. 6 inches, erect, bushy; flowers deep red.

185. White Queen (Carter).—A. 6 inches, straggly; flowers greenish-white.

186. Dobbie's Giant (Dobbie).—A. 8 inches, bushy, branched; flowers greenish-white with red anthers, freely produced on spikes 6 inches long.

MIRABILIS

—. *Jalapa* (Carter).—A. Failed to germinate.

NEMESIA

460, 461. Blue Gem (Barr, J. Veitch).—A. 8 inches, erect, branched; flowers 1 inch long, mauve, pale rosy-purple outside.

451. Fire King (Barr).—A. 9 inches, erect, bushy; flowers 1 inch long, scarlet, freely produced.

456, 450. Orange Prince (Barr, Carter).—A. 7 inches, erect, bushy; flowers orange-yellow, with violet throat, freely produced.

453, 459. *strumosa Suttoni* (Barr, J. Veitch).—A. 9 inches, spreading; foliage green, tinged with purple; flowers 1 inch long, of mixed colours.

457. *strumosa grandiflora nana compacta* (Vilmorin).—A. **A.M.** July 17, 1906. 8 inches, branched; flowers of mixed colours, freely produced.

452. *strumosa*, Dwarf Hybrids (Barr).—A. 6 inches, bushy; flowers very small, of mixed colours.

454. Triumph (Barr).—A. 7 inches, erect, branched; flowers of mixed colours, freely produced.

455, 458. Large-Flowered Mixed (Carter).—A. 6 inches, branched, straggly; flowers of mixed colours, freely produced.

NEMOPHILA

187. *atomaria oculata* (Barr).—A. 6 inches, semi-procumbent; flowers blue with white centres.

188. *insignis grandiflora* (Barr).—A. 6 inches, semi-procumbent; flowers larger than No. 187, blue with a white centre, freely produced.

NICOTIANA

611. *affinis*, New Hybrids (Carter).—P. Failed to flower.

NIEREMBERGIA

571. *frutescens* (Barr).—P. Failed to flower.

601. *gracilis* (Barr).—P. Failed to flower.

NIGELLA

189. *damascena fl. pl.* (Barr).—A. 9 inches, erect, branched; flowers pale blue, freely produced.

190. *integrifolia* (Barr).—A. 1¼ foot, erect, bushy; foliage much cut; flowers blue, freely produced.

191, 192. Miss Jekyll (Barr, Dobbie).—A. 1½ foot, erect, branched; flowers blue, freely produced.

OMPHALODES

193. *linifolia* (Barr).—A. 9 inches, bushy; foliage greyish, flowers small, white with a sulphur-yellow centre, freely produced.

PANICUM

—. *tonsum* (J. Veitch).—P. Failed to germinate.

PANSY

—. Fancy Mixed (Forbes).—P. Failed to flower satisfactorily.

PETUNIA

449. *concordia fl. pl.* (J. Veitch).—P. Failed to flower.

446. Empress (Carter).—P. 10 inches, erect, branched; flowers 3 inches across, purple and white with a veined throat.

447. Holborn Star (Carter).—P. 1 foot, spreading; flowers 2 inches across, purple and white with streaked throat, freely produced.

444. *hybrida grandiflora variegata* (Vilmorin).—P. 1 foot; flowers single, 3½ inches across, of mixed colours, freely produced.

445. *hybrida grandiflora fl. pl. concordia* (Roemer).—P. 1 foot, erect; flowers most double, of mixed colours, freely produced.

442. *hybrida grandiflora fimbriata fl. pl. concordia* (Roemer).—P. 1 foot, erect; flowers mostly double, of mixed colours.

443. New Marbled (Carter).—P. 1 foot, erect, branched; flowers single, pale rosy-purple with a dark purple throat.

PHACELIA

195. *campanularia* (Barr).—A. **F.C.C.** July 25, 1882, 1 foot, procumbent; flowers blue, very freely produced.

196. *campanularia caesia* (Barr).—A. 1 foot, more compact than No. 195; flowers white, not freely produced.

PHLOX DRUMMONDII

545. Apricot (Barr).—P. 6 inches, spreading; flowers apricot, not freely produced.

540. Bunch of Roses (Barr).—P. 6 inches, much branched; flowers 1¼ inch, varying from white through rose and magenta to scarlet.

547. Crimson Gem (Barr).—P. 6 inches, very compact; flowers 1 inch across, scarlet with a darker eye, freely produced.

543. Giant-flowered Dwarf (Barr).—P. 5 inches, branched; flowers rose, crimson, and purple, freely produced.

541. *grandiflora* (Vilmorin).—P. 7 inches, loosely spreading; flowers large, of mixed colours.

542. Dwarf Large-flowered Blue (Carter).—P. 3 inches, branched; flowers violet with large white centre, not freely produced.

539. Dwarf Large-flowered Carmine (Carter).—P. Similar to No. 540, but flowers much darker.

548. Dwarf Large-flowered Crimson (Carter).—P. Similar to No. 547, but not such a vigorous stock.

533. Dwarf Large-flowered Pink (Carter).—P. 4 inches, branched; flowers small, pink. Stock requires more selection.

538. Dwarf Large-flowered White (Carter).—P. 4 inches, erect, branched; flowers white.

536. Dwarf Large-flowered Mixed (Carter).—P. 4 inches, branched; flowers large, of mixed colours.

534. *hortensiaeflora*, Bright Rose (J. Veitch).—P. 6 inches, erect, branched; flowers large, rosy pink, freely produced.

546. *hortensiaeflora*, Finest Mixed (J. Veitch).—P. 6 inches, much branched; flowers 1½ inch across, ranging from white through rose and magenta to scarlet.

535. Large-flowered Mixed (Carter).—P. 1 foot, spreading; flowers large, of mixed colours, freely produced.

537. Pansy Blue (Barr).—P. 6 inches, erect, branched; flowers large, deep violet, freely produced.

532. Surprise (Barr).—P. 4 inches, erect, branched; flowers pink with white eyes.

544. Triumph (Barr).—P. 3 inches, branched; flowers vermilion, freely produced.

Poppy (*Papaver*)

197. Admiral (Nutting).—A. 1½ foot, of regular height; foliage grey; flowers single, white with edging of scarlet.

198. Cardinal Blush (Dobbie).—A. 1 foot, of regular height, compact; flowers double, light salmon-pink, petals finely cut.

199. Cardinal Scarlet (Dobbie).—A. 1 foot, compact; flowers double, red with a zone of white at the base of the petals.

200. Cardinal White (Dobbie).—A. **A.M.** July 15, 1903. 1 foot, erect, compact; flowers double, white, freely produced, petals finely cut.

201. Dainty (J. Veitch).—A. 1½ foot, regular in height; flowers single, pale pink with a purple blotch in centre of petals, freely produced.

202. Delphi Oracle (Barr).—A. 1¼ foot, branched; foliage green; flowers single, deep red, freely produced.

203. Double Scarlet (J. Veitch).—A. Did not flower.

204. Empress of China (Barr).—A. 2 feet, tall, bushy; flowers single, white edged with scarlet.

205. Giant Pæony Bright Lilac (Carter).—A. 2 feet, erect, compact; flowers large, double, heliotrope tinged with pink, freely produced.

206. Giant Pæony Bright Scarlet (Carter).—A. 2 feet, compact; flowers double, scarlet, freely produced.

207. Giant Pæony Bright Pink (Carter).—A. 2 feet, erect, branched; flowers large, double, red tinged with purple, petals undulate.

208. Giant Pæony Pure White (Carter).—A. 2 feet, erect, branched; flowers double, white tinged with cream at base of petals.

209. Giant Pæony White, Striped Scarlet (Carter).—A. 2 feet, branched; flowers double, white edged with crimson rose, freely produced.

210. New Feathered Light Rose (Carter).—A. 2 feet, erect, branched; flowers double, white edged with pink, freely produced.

211. New Feathered Salmon Rose (Carter).—A. 2 feet, erect, branched; flowers double, small, reddish purple with pinkish white colouring at base, freely produced.

212. New Feathered White (Carter).—A. 2 feet, erect, branched; flowers double, white, freely produced.

213. Pæony-Flowered Double Rose Brilliant (Barr).—A. 2 feet, erect, compact; flowers double, rose, freely produced.

214. Pæony-Flowered Double Choice Mixed (Barr).—A. 2 feet, erect, compact; flowers double, of mixed colours, freely produced.

215. Rawson's Fringed (Barr).—A. 1½ foot, compact; flowers double, scarlet streaked with white, freely produced.

216. St. Peter's Poppy (Sontellinho).—A. 1 foot, erect, compact; flowers double, white with scarlet tips, freely produced.

217. Scarlet King (Barr).—A. 1¼ foot, compact; flowers double, deep red, freely produced.

218, 219, 220, 221. Shirley (Barr, Carter, Dobbie, Wilks).—A. **F.C.C.**, July 2, 1901. 2 feet; colours ranging from white through rose, apricot, and salmon to bright scarlet. No trace of black in anthers or base of petals. Selected from *Papaver Rhoeas*.

222. White Colossal (Barr).—A. 1 foot; flowers double, white.

223. White Swan (Barr.—A. 1 foot; flowers double, white, freely produced.

PORTULACA

559. Double Splendid Mixed (Barr).—A. Failed to flower satisfactorily.

561. Large-flowered Double Mixed (Carter).—A. Failed to flower satisfactorily.

560. Large-flowered Single Mixed (Carter).—A. Failed to flower.

563. Single Splendid Mixed (Barr).—A. Failed to flower.

562. *grandiflora fl. pl.* (Vilmorin).—A Failed to flower.

RICINUS

627. *cambodgensis* (J. Veitch).—A. 1 foot; leaves large, 9 inches across, purplish-green, stem copper-reddish colour. A form of *R. communis*.

622. *Gibsoni* (Barr).—A. Similar to No. 627.

623. *Gibsoni mirabilis* (Barr).—A. Similar to No. 627.

624. *panormitanus* (Barr).—A. Similar to No. 627, but leaves are glaucous.

626. *sanguineus* (Barr).—A. Similar to No. 627, but leaves are green tinged with bronze.

625. *zanzibarensis* (J. Veitch).—A. Similar to No. 627.

RUDBECKIA

246. *amplexicaulis* (Barr).—A. 1¼ foot, erect, branched; flowers single, yellow with greenish-black centre.

247, 248. *bicolor superba* (Barr, Carter).—A. 2 feet, erect and branched, covered with stiff hairs; flowers single, 2½ inches across, yellowish-brown with sepia centre, freely produced.

249. Cactus-Flowered (Carter).—A. Similar to No. 247, but flowers semi-double. Germinated badly.

250. *Drummondii* (Barr).—A. Failed entirely.

SALPIGLOSSIS

519. Beauty (Barr).—A. Failed to flower.

517. Emperor (Barr).—A. 1½ foot, leafy at base of plants; flowers single, 2¼ inches across, brown and pale purple.

518. Large-Flowered (J. Veitch).—A. Failed to flower.

520. Princess Ida (Barr).—A. Failed to flower.

521. *superbissima*, Mixed (Barr).—A. 2 feet; flowers single, deep maroon-red with yellow and sepia-brown centre.

606. The Moor (Barr).—A. Failed to flower.

516. Violet Queen (Barr).—A. 1½ foot, leafy at base; flowers single, 2¼ inches across, violet with yellow and dark purple markings. Stock requires more selection.

SALVIA

582. Dwarf Scarlet Zurich (J. Veitch).—P. Failed to flower.

603. *splendens*, Fireball (Pfitzer).—P. Failed to flower.

SANVITALIA

253. *procumbens* (Barr).—A. Regular in height, procumbent; flowers small, yellow with brown centre, freely produced.

254. *procumbens*, Double (Barr).—A. Stock requires more selection.

255. *procumbens*, Little Gem (Barr).—A. Dwarf, 3 inches, compact; flowers single, yellow with brown centre.

SAPONARIA

521, 522. *calabrica*, Scarlet Queen (Barr, Carter).—A. 5 inches, bushy; flowers minute, crimson, freely produced.

SCABIOUS

486. Black King (Barr).—A. 2 feet, erect; flowers 2 inches across, pale violet, rose pink, dark crimson, and dark pink.

509. *caucasica*, Diamant (R. Veitch).—P. Failed to flower.

487. Coral Pink (Barr).—A. 1 foot, erect, compact; flowers 1¾ inch across, colours mixed, not freely produced.

485. Double Dwarf Blue (Carter).—A. 1¼ foot, erect, bushy; flowers 1½ inch across, pale violet, freely produced.

489. Double Dwarf Carmine (Carter).—A. 1½ foot; flowers 1¾ inch across, dark crimson.

496. Double Dwarf Crimson (Carter).—A. Failed to flower.

495. Double Dwarf Purple (Carter).—A. Failed to flower.

491. Double Dwarf Rose (Carter).—A. 1½ foot; flowers 1¾ inch across, rose pink.

490. Double Dwarf White (Carter).—A. 1½ foot; flowers white, freely produced.

497. Tall Fairy Queen (Carter).—A. Failed to flower.

488. Fairy Selected (Barr).—A. 2 feet, erect; flowers 2¼ inches across, mostly pale violet.

494. Scarlet King (Barr).—A. Failed to flower.
493. Snowball (Barr).—A. Failed to flower.
508. The Pompadour (Carter).—A. Failed to flower.
492. Yellow Prince (Barr).—A. Failed to flower.

SCHIZANTHUS

256. Dwarf Hybrids Mixed (Barr).—A. 1 foot, erect; colours of flowers mixed, but all have a yellow blotch on petals, freely produced.
257. *Grahami* (Barr).—A. Failed to flower.
258. *Grahami niveus* (Barr).—A. 1¼ foot, erect, straggly; flowers white with yellow blotches, freely produced.
259. *grandiflorus albus* (Barr).—A. Straggly; flowers white with yellow blotches, freely produced.
260. *grandiflorus nigricans* (Barr).—A. 1½ foot; flowers dark maroon, very freely produced.
261. *papilionaceus* (Barr).—A. 1½ foot, bushy; flowers blue and white with yellow spots, very freely produced.
262. *papilionaceus* (Carter).—A. Similar to No. 261, but spotted with dark purple.
263. *wisetonensis* (Barr).—A. 1 foot; flowers whitish brown, very freely produced.

SILENE

264. *Bonnettii*, Dwarf Double Rose (J. Veitch).—A. Dwarf, 3 inches, bushy; flowers minute, red.
265. Double Dwarf Peach Blossom (J. Veitch).—A. Dwarf, 3 inches, very compact; flowers pink and pale salmon pink, freely produced.
266. *Fortunei rosea* (J. Veitch).—A. Failed entirely.
267. *pendula Bonnettii* (Barr).—A. Dwarf, 4 inches, very compact; flowers pink, freely produced.
268. *pendula compacta*, Peach Blossom (Barr).—A. Similar to No. 267.
269. *pendula compacta*, Empress of India (Barr).—A. Similar to No. 267.
270, 271. *pendula compacta*, Snow King (Barr, J. Veitch).—A. 4 inches; flowers white.
272. *pendula*, *Bijou* (Barr).—A. Dwarf, 2 inches, compact; flowers salmon-pink, freely produced.

SOLANUM.

584. *pyracanthum* (Barr).—P. Failed to flower.
583. *robustum* (Barr).—P. Failed to flower.

STATICE.

273, 274. *Bonduelli* (Barr, J. Veitch).—P. 2 feet, branched; flowers small, yellow.
275. *sinuata* (Barr).—A. 2 feet; flowers heliotrope with white inner tube. Germinated badly.
276, 281. *sinuata alba* (J. Veitch, Wallis).—A. Similar to No. 275, but flowers white.

277. *sinuata*, Blue (J. Veitch).—A. Similar to No. 275, but germinated well.

278. *sinuata candidissima* (Barr).—A. Similar to No. 276, but germination poor.

279. *sinuata rosea* (Roemer).—A. Similar to No. 275, but flowers pink with pale yellow inner tube.

280. *sinuata Bonduelli* (Wallis).—A. Similar to No. 275, but flowers yellow.

282. *Suworowii* (Wallis).—A. **A.M.** June 10, 1884. Failed.

STOCK.

363. All the Year Round (Barr).—A. 6 inches; foliage dark green; flowers double, in short pyramidal spikes, white, freely produced.

364. Apricot (Barr).—A. 6 inches, erect; flowers pale salmon pink, freely produced.

366. Branching Lilac (Barr).—A. 8 inches, erect, branched; flowers purplish-heliotrope.

369. Brompton (Robson).—A. Failed to flower.

359. Large-flowered Mixed (Carter).—A. 1 foot, erect, branched; foliage greyish; flowers of mixed colours.

349. East Lothian Crimson (Forbes).—A. Failed to flower.

352. East Lothian Crimson Wall-leaved (Forbes).—Failed to flower.

357. East Lothian Purple (Forbes).—A. 6 inches; foliage tinged with grey; flowers double, in pyramidal spikes, violet blue, freely produced.

351. East Lothian Scarlet (Forbes).—A. 8 inches; foliage tinged with grey; flowers single, in racemes, pink, not freely produced.

350. East Lothian White (Forbes).—A. 8 inches, erect; foliage greyish; flowers in pyramidal spikes, white.

353. East Lothian White, Wall-leaved (Forbes).—A. **A.M.** September 6, 1907. 6 inches, erect, compact; foliage dark green; flowers in pyramidal spikes, white.

370. Scarlet Brompton, Veitch's selected (R. Veitch).—A. Failed to flower.

371. Virginian Fairy Queen (Barr).—A. 9 inches, straggly; flowers single, purple or crimson red.

368. White Brompton, Veitch's selected (R. Veitch).—A. Failed.

367. White Standard (Barr).—A. 1½ foot, erect, unbranched; flowers in racemes 15 to 18 inches long, white. Stock requires more selection.

358. Winter Almond Blossom (Sydenham).—A. 9 inches, erect; foliage greyish; flowers in dense spikes, white tinged with rose, freely produced. Stock requires more selection.

361. Winter Beauty of Nice (Sydenham).—A. 1 foot, erect, branched; flowers in racemes, pink, freely produced.

360. Winter Crimson King (Sydenham).—A. 1 foot; flowers crimson, very freely produced.

362. Winter Light Violet (Sydenham).—A. 1¼ foot; flowers heliotrope, freely produced.

365. Winter Queen Alexandra (Sydenham).—A. 1 foot; flowers rosy pink, very freely produced. A showy variety.

354. Winter Rose of Nice (Sydenham).—A. Failed to flower.

356. Winter White of Nice (Sydenham).—A. Failed to flower.

355. Winter Yellow (Sydenham).—A. 9 inches; flowers on pyramidal spikes, cream and white, freely produced. Stock requires more selection.

TAGETES

323. *erecta*, Dwarf Orange (Barr).—A. **XXX.** September 5, 1889. 1 foot, erect, compact; flowers 3-4 inches across, double, orange-yellow, freely produced.

322. *erecta*, Giant Orange (Carter).—A. 1 foot; flowers mostly semi-double, some single, 2-3 inches across, orange, freely produced.

325. *erecta*, Giant Lemon (Carter).—A. 1 foot; flowers 2 inches across, yellow.

324. *erecta*, Lemon Queen (Dobbie).—A. **F.C.C.** August 9, 1887. 2 feet, bushy; flowers lemon-yellow, freely produced.

326. *erecta*, Light Yellow Large-flowered (Barr).—A. 1½ foot; flowers 4 inches across, deep lemon-yellow: a very good stock.

330. *erecta*, Orange Large-flowered (Barr).—A. 2 feet, bushy; flowers 4 inches across, deep orange.

328. *erecta*, Prince of Orange (Dobbie).—A. **F.C.C.** August 9, 1887. 1½ foot, spreading; flowers deep orange-yellow, freely produced.

338. *patula*, Compact Gold Striped (Carter).—A. 9 inches, compact; flowers 1½ inch in diameter, brown with gold stripes.

335. *patula*, Dwarf Orange (Barr).—A. 9 inches, compact; flowers 1½ inch across, orange-yellow, freely produced.

333. *patula*, Extra Dwarf Orange (Barr).—A. 6 inches, compact; flowers 1 inch across, orange-yellow, freely produced.

332. *patula*, Extra Dwarf Striped (Barr).—A. 9 inches, very bushy; flowers double, reddish-orange with thin yellow margin.

342. *patula*, Gold-edged (Barr, Carter).—A. 6 inches; flowers double, orange tinted with brown and yellow lip to petals, freely produced.

336. *patula*, Gold-striped (Barr).—A. 6 inches, bushy; flowers large, double, reddish-orange with yellow tip. Stock requires slightly more selection.

341. *patula*, Gold-striped (Nutting).—A. Similar to No. 336; but colours slightly mixed.

339, 337. *patula*, Legion of Honour (Carter, Dobbie).—A. 9 inches; flowers single, yellow with a red blotch at base of each petal, freely produced.

334. *patula*, Silver King (Carter).—A. 6 inches; flowers single, 1½ inch across, yellow with reddish-orange blotch at base of petals, disc brownish-yellow, freely produced.

329. *patula*, Selected (Dobbie).—A. 2 feet, bushy; flowers 2 inches across, various shades of yellow and brown; showy.

331. *patula*, Single Mixed (Barr).—A. 9 inches; flowers orange-yellow streaked with brown, freely produced. Very showy.

327. *patula*, Scotch Prize Strain (Barr).—A. 1½ foot; flowers orange-brown with yellow stripes. Stock requires more selection.

345. *patula nana var.* (Vilmorin).—A. 6 inches, very compact; flowers single, 1½ inch across, yellow with deep brown spots at base of petals.

347. *patula*, Miniature Brown (J. Veitch).—A. 8 inches; flowers single, 1½ inch across, yellow with dark brown spots at base; freely produced. Stock requires more selection.

344. *patula*, Miniature Golden (J. Veitch).—A. 6 inches, bushy; flowers double, orange, freely produced.

346. *patula*, Miniature gold-margined (J. Veitch).—A. 6 inches; flowers single, yellowish-brown with maroon blotch at base.

343. *patula*, Miniature Silver King (J. Veitch).—A. 6 inches, erect, compact; flowers single, yellow with red spot at base of petals, freely produced.

348. *patula*, Miniature Sulphur (J. Veitch).—A. 8 inches; flowers double, deep yellow with a few brown roques. Stock requires more selection.

TROPAEOLUM

224. Aurora (Barr).—A. Failed.

225. Beauty of Malvern (Barr).—A. 1 foot, compact; foliage green; flowers bright scarlet, freely produced, lasting well.

226. *canariense* (Dobbie).—A. Canary creeper; climber; flowers yellow.

227. Dwarf Perfection (Barr).—A. 9 inches; foliage variegated with white; flowers scarlet, very freely produced.

228. Empress of India (Barr).—A. **XXX**. July 14, 1887. 9 inches, bushy; foliage green tinged with dark purple; flowers deep crimson; very freely produced.

229. Fire King (Barr).—A. 9 inches, rather straggly; foliage light green; flowers bright scarlet, freely produced.

230. Golden Queen (Carter).—A. 9 inches, compact; foliage light green; flowers yellow, freely produced. Good.

231. Golden King (Barr).—A. 9 inches, compact; foliage dark green; flowers yellow, freely produced. Good.

232. *Lobbianum*, Princess Victoria Louise (Vilmorin).—A. Climber; foliage green; flowers orange with red blotch in the centre of each petal. Very pretty.

233. *majus nanum var.* (Vilmorin).—A. 6 inches, very bushy; flowers of mixed colours.

234. Pearl (Barr).—A. **XXX**. July 14, 1887. 6 inches, compact; flowers yellow, freely produced.

235. Queen of Tom Thumbs (Barr).—A. 4 inches; foliage variegated with white; flowers bright scarlet.

236. Queen of Tom Thumbs (R. Veitch).—A. 6 inches; foliage variegated with white; flowers deep crimson with yellow centre, freely produced.

237. Ruby King Improved (Barr).—A. 6 inches; foliage dark green; flowers deep crimson with yellow centre, freely produced.

238. Scarlet King of Tom Thumbs (Carter).—A. 6 inches, bushy; foliage dark green tinged with purple; flowers scarlet, freely produced.

239. Tom Thumb Cloth of Gold (Carter).—A. 8 inches, bushy; foliage greenish yellow slightly variegated with white; flowers scarlet, freely produced.

240. Tom Thumb Dobbie's Crimson (Dobbie).—A. **XXX.** July 14, 1887. 6 inches, very compact; foliage deep green tinged with purple; flowers dark crimson, freely produced.

241. Tom Thumb Dark-leaved vars. (Carter).—A. 6 inches; foliage much tinged with purple; flowers various shades of yellow and red.

242. Tom Thumb Golden King (Dobbie).—A. 6 inches, straggly; foliage yellowish-green; flowers orange-yellow.

243. Tom Thumb Scarlet (Dobbie).—A. 8 inches, straggly; foliage light green; flowers scarlet, freely produced.

VERBENA

Owing to the damp and cold season, the seedling Verbenas failed to flower satisfactorily.

468. Dark Velvety Blood Crimson (Barr).—P. Failed to flower.

474. *hybrida* Mixed (Vilmorin).—P. Failed to flower.

—. *hybrida auriculaeflora* (Pfitzer).—P. Failed to flower.

473. Holborn Mammoth (Carter).—P. Failed to flower.

469. Mammoth Brilliant Rose (Carter).—P. Failed to flower.

470. Mammoth Dark Scarlet vars. (Carter).—P. Failed to flower.

—. Rosamund (Barr).—P. Failed to flower.

467. Scarlet Gem (Barr).—P. Failed to flower.

472. Snow White (Barr).—P. Failed to flower.

—. Velvety Purple (Barr).—P. Failed to flower.

VINCA

294. *rosea* (J. Veitch).—P. Failed entirely.

295. *rosea alba* (J. Veitch).—P. Failed entirely.

VIOLA

599. Mixed (Forbes).—P. Failed to flower satisfactorily.

VISCARIA

296. *cardinalis* (Barr).—A. **XXX.** July 9, 1889. 4 inches; flowers deep red with maroon centre, freely produced.

297. *cardinalis fulgens* (Barr).—A. **XXX.** July 27, 1898. Similar to No. 296, but flowers deep crimson.

298. *coerulea* (Barr).—A. **XX.** July 9, 1889. Similar to No. 296, but flowers blue.

299. *elegans picta* (Barr).—A. Similar to No. 296, but flowers white with crimson blotch at base of petals.

300. *oculata alba* (J. Veitch).—A. Similar to No. 296, but flowers white.

WALLFLOWER

304. Early Blood Red (Barr).—P. Failed to flower.

303. Early Cream Coloured (Barr).—P. 9 inches, bushy; flowers in short racemes, brownish-crimson.

302. Golden Gem (Barr).—P. 9 inches, bushy; flowers yellow.

301. Extra Early Parisian (Barr).—P. 9 inches; flowers brownish-yellow.

ZEA

617. *gracillima* (Barr).—A. 2 feet; leaves undulate, green or variegated with white, some slightly tinged with purple.

620. *gracillima pumila zebrina* (Barr).—A. 2½ feet; leaves chiefly green or variegated with white.

618. *japonica quadricolor perfecta* (J. Veitch).—A. 2 feet, branched at base; leaves pale green striped with pale purple and brown.

—. *japonica gigantea* (Vilmorin).—A. Failed to germinate.

621. *quadricolor perfecta* (Barr).—A. Similar to No. 618.

ZINNIA

500. Dwarf Double (Barr).—A. 9 inches, compact; flowers double, 1¾ inch across, colours from white through magenta to crimson.

505. Double Fireball (Carter).—A. 1 foot; flowers small, scarlet, freely produced.

501. *elegans grandiflora fl. pl.* (Vilmorin).—A. 1 foot, compact; flowers double, 3 inches across, colours ranging from yellow and pink to scarlet.

507. *Haageana* (Barr).—A. 1 foot; flowers single, dark yellow with orange centre, freely produced.

502. Large-flowered Double Mixed (Barr).—A. 1 foot; flowers double, 3 inches across, of mixed colours.

499. Mammoth Mixed (Carter).—A. 1 foot, spreading; flowers double, 2½ inches across, of mixed colours, freely produced.

498. *mexicana*, Gipsy Girl (Barr).—A. 6 inches; flowers single, maroon with yellow tips to petals, freely produced.

504. *mexicana hybrida fl. pl.* (Vilmorin).—A. 6 inches; flowers of mixed colours, freely produced.

503. Miniature Mixed (Barr).—A. 6 inches, compact; flowers 1 inch across, of mixed colours, not freely produced.

506. *elegans imbricata grandiflora plenissima* (Pfitzer). — A. 1¼ foot, much branched; flowers double, 3 inches across, of mixed colours.

LEEKS AT WISLEY, 1909 AND 1910.

Prizetaker (Selected) (Barr).—A first-class leek of the Musselburgh type, making fine, long, stout stems, which blanch readily and are of a fine white colour; leaves long, broad, and strap-like.

Musselburgh (Selected) (Barr.)—A really fine leek, making long, straight stems, which blanch readily and are of a pure white colour, with long strap-like leaves of a dark green.

Ayton Castle (Barr).—A useful leek for general purposes, with broad leaves of a dark-green colour; blanches well, but is not so white as the last.

Giant Winter (Barr).—An excellent leek of the Ayton Castle type; blanches readily, and is a pure white colour.

Utrecht Winter (Spruyt).—A very good leek of the Musselburgh type, but quite yellow inside when blanched.

No. 1 (Barr).—A useful leek of the Ayton Castle type.

No. 2 (Barr).—Does not make a really good leek; Musselburgh type.

No. 3 (Barr).—A fine large leek of the Ayton Castle type; broad strap-like leaves; blanches well, inside a sulphur-yellow.

Giant Italian Leek (Dammann).—Not hardy; does not stand the winter.

WINTER SPINACH AT WISLEY, 1909 AND 1910.

Winter Utrecht (Spruyt).—A very good variety of the prickly-seeded spinach, broad and pointed leaves of a dark-green colour, very hardy, and stands well in spring.

Broad-leaved, Long-standing (Spruyt).—A useful variety, with large round leaves, but does not stand the winter so well as the former.

EXAMINATION OF EMPLOYEES IN PUBLIC PARKS.

January 10, 1910.

The Royal Horticultural Society's fifth Examination of Employees in Public Parks was held on January 10, 1910.

As on former occasions, the Examination was partly *viva voce* and partly written, occupying three hours and twenty minutes. It was held at the Society's Hall in Vincent Square, Westminster.

Ninety-one candidates entered, and of these thirty-one secured places in the first class, twenty-six in the second, and twenty-five in the third, leaving only nine candidates who have failed altogether to satisfy the examiners. The number of entrants was smaller than for some years past, but this was anticipated, for the majority of the London parks gardeners had already secured positions in the pass lists. It is hoped that more candidates will in future years be sent from the public parks and gardens of the many cities and towns of the Provinces.

Speaking generally, the results of this year's Examination are above the average, and in a few cases very high marks have been obtained. There was less tendency in the answers to give information not asked for in the question, but there is still a noticeable lack of understanding of many simple garden terms, such as "indigenous," "alluvial," &c. Although instructed in prominent black letters at the head of the questions, some candidates did not attempt the compulsory question xvi., asking for a description of the public park or garden in which they work, and they have only themselves to thank for the number of marks thereby necessarily lost.

Greater knowledge was shown in the choice of ornamental deciduous trees suitable for planting round the margins of lakes, &c., the selections being both good and varied; the botanical names also were for the most part correctly quoted—an indication that winter evening hours had not been wasted. The selection of plants for a well-coloured autumn border was in most cases excellent, but the sketch plans for the arrangement of the plants showed a great want of knowledge and observation of the precise value and habit of different varieties, and also of colour-harmony. There was also much indecision of mind as to evergreen and deciduous shrubs, instead of a clear, well-defined knowledge as to the exact qualities which constitute the line dividing the two. Very rarely was a good selection of "effective evergreen flowering shrubs" given. Similar confusion existed as to which are our own reputedly native British trees, introductions from all parts of the world being included in the answers. The original source of trees and plants should be made a subject of study, as such knowledge is in many cases quite indispensable in understanding

their varying requirements and treatment. The chemistry of the soil also deserves greater study, some candidates giving oxygen, nitrogen, mildew, and moss as examples of the constituents of plant ash found in soils.

It is hoped that candidates low in the list will not be disheartened, but encouraged, by the greater success of their fellows, to work on to higher places next year. With so encouraging a report as only nine actual failures there is every hope for those who have only won a third class to work up to the second, and the seconds up to the first class. And with patient endeavour and careful observation, coupled with intelligent inquiry into the reasons and causes for what is done and observed during the coming season, much progress should be made and useful knowledge stored up in readiness not only for the next Examination, in January 1911, but to be put into practice during the whole of life's work.

It should perhaps be put on record that there is absolutely no difference of merit whatsoever in being placed in Division A or in Division B. A first Class in one is as good as a first Class in the other. The two Divisions are only kept up for the convenience of certain public authorities.

C. R. Fielder,
Owen Thomas,
John W. Odell,
W. Crump,
Edward White,
G. Gordon,
E. Beckett,
W. Wilks.
} *Examiners.*

DIVISION A.

Class I.

1. West, Alfred J., 23A Oaksford Avenue, Sydenham.
2. Drage, E., 48 Emmett Street, Mile End.
3. Hodge, W. A., White Lodge, Victoria Park, N.E.

Class II.

1. Hurley, J., 141 Trundley's Road, Deptford.
2. MacConachie, J. S., 2A Scawen Road, Deptford.
3. { Jones, Edward, 120A Wycliffe Road, Lavender Hill.
   { Godfrey, A. T., 30 Aliwal Road, Clapham Junction.
5. Collop, T., 29 Saltwood Grove, Walworth.
6. Gray, W. J., 24 New Church Road, Camberwell.

Class III.

1. Lambourne, C., 72 Clive Road, Dulwich.
2. Crombie, J., 3 Milton Chambers, Cheyne Walk, Chelsea.

DIVISION B.

Class I.

1. Butcher, Percy G., 2 Luxford Street, Rotherhithe.
2. Hotten, H. W., 22 Christie Road, South Hackney.
3. Middlemiss, T. J., 51 Clement's Road, Bermondsey.
4. Illman, G., 27 North Road, Highgate.
5. Ashmore, S., 154 Bury Street, Lower Edmonton.
6. Oldham, C., 69 Gloucester Road, Kew.
   Holder, P. E., 49 Durham Road, West Green.
8. Chipperfield, A., 502 Southwark Park Road, Rotherhithe.
9. Ellott, H., 202 Crystal Palace Road, East Dulwich.
10. Snowden, J. D., 21 Alexandra Road, Richmond.
    Parker, Jas., 29 Northcote Road, Longlands, Sidcup.
12. White, W. J., 56 Branksome Road, Brixton.
    Bland, W., 119 Salop Road, Walthamstow.
14. Ottaway, G., 128 Dartmouth Park Hill, N.
15. Lee, W. R., 97 Abbott Road, Poplar.
    Webb, H. W., 49 Vespan Road, Shepherd's Bush.
    Ringe, J. E., 7 Freeland Street, Battersea.
18. Walkden, C. H., 95 Herne Hill Road, S.E.
19. Sirett, F. W. G., 13F Block, Peabody's Buildings, Herne Hill.
20. White, H. G., 8 Albion Gardens, Hammersmith.
21. Musk, W. J., 11 Laver's Road, Stoke Newington.
    Medlock, H. R., 134 Green Street, Forest Gate.
23. White, J. C., 29 Bowdale Road, Lordship Lane.
24. Hyde, J., 62 Langdon Road, Upper Holloway.
25. Featherstone, E., 62 Strahan Road, Bow.
26. Smith, Robert, 86 Hawksley Road, Stoke Newington.
    Coffey, D., 6 Hanlon's Road, Eltham.
28. Jenner, T. J., 13 Gretton Houses, Bethnal Green.

Class II.

1. Spashett, T., 95 Laleham Road, Catford.
2. Jepps, J., 128 Dartmouth Park Hill, Upper Holloway.
3. Blaxall, W. C. F., 28 Bethel Road, Welling.
4. Thurgood, H., 3 St. Albans Road, Highgate, N.W.
5. Barker, C. T., Lawn Cottage, Sidcup.
   Hurrell, J., 16 Jubilee Cottages, Eltham.
7. Hammill, H. W., 39 Miranda Road, Upper Holloway.
8. Salvage, B. H., 308 Kew Road, Kew.
   Bennett, F., 116 Beresford Road, Harringay, N.
10. Cole, C., 15 Colestown Street, Battersea.
11. Duncan, G., 31 Rowland Grove, Upper Sydenham.
    Easter, G., 14 Highbury Terrace, Highbury, N.
13. Butler, R. D., 8 Ravensdon Road, Kennington Park.
    Radley, W. H., 80 Southwold Road, Upper Clapton.
    Coulter, F. G., 92 Odessa Road, Forest Gate.
    Monkelow, F., 159 Boundary Road, Barking.

17. Anderson, Arthur W., Laurels, Bois Moor Road, Chesham.
18. Knowles, F. H., 8 Albion Gardens, Hammersmith.
19. Gates, W., 22 Motley Street, Wandsworth Road, S.W.
    Morley, A., 16 Sidworth Street, Hackney.

Class III.

1. Turner, C. A., 2 Chase Green, Enfield.
   Williams, F., 11 Royal Street, Lambeth.
3. Butler, E. A., 10 Juer Street, Battersea Park.
   Power, W., 152 Old Ford Road, Victoria Park.
5. Mouser, H., 4 Lauderdale House, Waterlow Park.
6. Herne, H., 171 Railton Road, Herne Hill.
7. Read, C., 33 Henslowe Road, East Dulwich.
   Maythorn, R. F., 7 Harrogate Road, South Hackney.
   Peck, C. R. Y., 502 Southwark Park Road, Rotherhithe.
10. Atkey, W., 42 Plimsoll Road, Finsbury Park.
11. Wills, W. H., 8 Tennyson Road, South Wimbledon.
12. Edney, G. T., 6 Nursery Cottages, Lea Bridge, Leyton.
    Poyser, W., 11 North Hill, Highgate.
14. Humphreys, J. J., 21 Dunstans Road, East Dulwich.
15. Ottley, G., 103 Chedington Road, Upper Edmonton.
16. Andrews, S., 110 Dartmouth Park Hill, N.
17. Hickford, E., Lauderdale House, Highgate Hill.
18. Free, C. T., 15 Handforth Road, Brixton.
    Baker, G., 48 Seaford Road, South Tottenham.
20. Ricketts, W. H., 20 Lulot Street, Highgate, N.
21. Boyle, R. W., 162 Sunnyhill Road, Streatham.
22. Gibbins, C. D., 2 Ward's Cottages, Highgate.
23. Maddox, A., 47 Girdlestone Road, Upper Holloway.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

Judging by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 264, 265.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
Ballard, E., F.R.H.S.
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Newstead, R., A.L.S., F.E.S., F.R.H.S.
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Petts, Alger, F.R.H.S.
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Scott-Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
Smith, William G., B.Sc., Ph.D., F.R.H.S.
Swire, J., F.R.H.S.
Veitch, Harry J., F.L.S., F.Z.S., F.R.H.S.
Voss, W. A., F.C.S., F.R.H.S.
Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bulletino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franc.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mendel Journal	Mendel Jour.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Orchid Review	Orch. Rev.

Journals, &c.	Abbreviated title
Orchis	Orchis.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abutilon sinense. By S. Mottet (*Rev. Hort.* Oct. 1, 1909, pp. 450-453; 1 illus. and col. plate).—Introduced from Eastern China. It forms a shrub about 20 feet high. The flowers are large, well expanded, and of a brilliant yellow with purplish-red veins radiating from the centre to half-way up, forming a very attractive inflorescence. Flowers in the spring. Requires protection during the winter.

C. T. D.

Acanthorhiza aculeata, Aerial Roots of. By Bertha Chandler (*Trans. Roy. Bot. Soc. Edin.* vol. xxiv. part iv. pp. 20 to 24; 2 plates).—A reinvestigation, revising Freidrich's paper of 1880, of the remarkable aerial roots of this palm. The roots, after reaching a certain length, shed their root cap and harden into thorn-like structures.

E. A. Bd.

Agave, Key to the Genus. By Carl Muller (*Bot. Zeit.* lxvii. 1 Abt. Hefte v./vii. July 1909, pp. 93-139; with 22 figs. and 2 plates.—The comparative anatomy of the leaf in all the species of *Agave* cultivated in Europe is described fully. There is a very full key to the various species, from which it should be possible to name any of them from leaf characters only. Some of the characters used might require a certain microscopical skill, as *e.g.* the following:

"Breadth of epidermis cells, 0·0392 mm. Inner opening of stomata rather small. *A. multiflora.*

"Breadth of epidermis cells, 0·0196 mm. Inner opening of stomata rather large. *A. Goeppertiana.*"

But most of them should not give any very great trouble.

G. F. S.-E.

Agonis marginata. By J. Hutchinson (*Bot. Mag.* tab. 8301). Nat. ord. *Myrtaceae*; tribe *Leptospermeae*. Western Australia. Shrub 6-10 ft. high. Leaves obovate-oblong, ½-1¼ in. long. Flowers clustered, axillary, almost globose, 10-20 flowered. Corolla white.

G. H.

Alfalfas, Wild, and Clovers of Siberia. By N. Hansen (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 150, May 1909; map).—There is apparently no native American alfalfa or lucerne (*Medicago*). The plant was originally introduced into South America, and later into California, by the Spaniards, and most of the varieties now in cultivation in the United States owe their origin to species which were originally natives of the temperate regions of Western Asia. It is one of the favourite crops in the oases of North Africa, and it is probable that its original habitat extended from the N.W. frontier of India to the shores of

the Mediterranean. In other words, they have been endeavouring in America to cultivate common lucerne far north of its ancient haunts, and, though the process is fairly successful in regions where there is the protection of an abundant snowfall, no pure strain of *Medicago sativa* has yet appeared sufficiently hardy for the large area of the Prairie Northwest, where the most severe cold occasionally comes with no snow on the ground.

To fill up this evident want, the writer of this bulletin was despatched by his Department on a series of adventurous journeys through Siberia, Turkestan, Western China, and Manchuria, where he had already discovered the existence of some native lucernes, and where the climatic conditions bore a fairly close resemblance to those of the American Northwest. As a result of these expeditions he was able to collect seeds of several hardy varieties, which he hopes will eventually remove the existing difficulties. He also brought back some varieties of clover which he thinks should prove valuable.

He holds that the botanical name alone is no guide as to the constitution of any plant. Hardiness is sometimes a peculiarity of individual species, sometimes the result of some unsuspected cross; but before starting to try to breed a plant suited to quite other conditions than those to which it has been accustomed, it is as well to find out whether Nature, who has plenty of time, has not somewhere been already at work in the same direction, and is not, perhaps, in a position to do away with the need of many years of costly experiment.—*M. L. H.*

Apple and Pear Scab. By P. J. Carmody (*Jour. Dep. Agr. Vict.*, September 1909, p. 585).—Spray with Bordeaux mixture before the petals of the bloom expand, and when the spray can run along the stems of the flower. As some varieties of apples russet under the action of this spray—notably Jonathan, Sturmer, Ben Davis, Cole's Rymer, etc.—it would be as well for growers to try the self-boiled lime and sulphur spray after the fruit has set, especially such fruit as is not unduly liable to black spot. This mixture must be properly made as directed and only good lime used, with no cooking of the sulphur, otherwise serious damage to the foliage will ensue. It is wise to test a tree or two before generally adopting this spray.—*C. H. H.*

Apple Culture in Mountain Regions. By W. N. Hutt (*U.S.A. Dep. Agr., N. Carolina, Bull.* vol. xxix. No. 8, August 1908; 4 figs.).—The author maintains that the apple tree in its soil and fertilizer requirements differs little from a forest tree, and that where a natural forest is taken off the mountain slopes in the south a plantation of fruit trees can profitably succeed it, producing fine trees and more highly coloured and better-flavoured fruit than can be obtained from lower lands in the north, which are equally cool but less sunny, the mountain regions of the south getting the clear air and abundant sunshine of that latitude without that excessive heat which is detrimental to the apple. Another advantage favouring apple culture in such

regions is the perfect water drainage which can be obtained at little or no expense, as well as some amount of natural irrigation; while the atmospheric drainage reduces the damage to blossom by frost to a minimum. The greater part of the bulletin is taken up with instructions as to laying out and planting a mountain orchard, while the subsequent cultivation of the soil and the forming of the trees is also dealt with.—*A. P.*

Apple Production. By A. D. (*Garden*, Dec. 25, 1909, p. 628).—The export of English apples to the United States is noticed.—*H. R. D.*

Armillaria mucida, The Biology of. By C. E. C. Fischer (*Ann. Bot.* xxiii. Oct. 1909, pp. 515-533; 2 plates).—The life history of this fungus—the White Agaric of Beech—as grown in artificial cultures is described. Growth takes place rapidly in the usual culture media, and in bread cultures sporophores were readily obtained. The time elapsing between sowing the spores and the ripening of the sporophores in pure cultures varied between fifty-one and 109 days. No secondary spore-forms were observed.

With regard to the relationship of the fungus to the host, efforts to infect living beech failed, and the author was unable to confirm previous statements as to its parasitism. At the same time it is possible that *A. mucida* is a facultative parasite. The fungus readily reduces lignin to cellulose, and on account of its injurious effect on timber should be vigorously combated.—*A. D. C.*

Armillaria mucida, The Development of the Fructification of. By C. C. E. Fischer (*Ann. Bot.* xxiii. 1909, pp. 503-507; 1 plate).—The paper gives a short account of the structure and development of the fruits of this common beech parasite. The author finds that it agrees with *Agaricus campestris* as described by Atkinson, rather than with Hartig's account of *A. mellea*. The marginal veil is not an aftergrowth, but formed by the neutral issue which is present from the beginning. The origin of the hymenium is endogenous. The mucilaginous coating of the pileus is due to the degeneration of the surface tissue.—*A. D. C.*

Army Worm, The Semi-tropical. By F. H. Chittenden and H. M. Russell (*U.S.A. Dep. Agr. Bur. of Entom. Bull.* 66. part 5; Jan. 1909; figs.).—This pest (*Prodenia eridania* Cram.) is confined to semi-tropical America as a pest, having spread from weeds to garden crops of various sorts. It is a smooth caterpillar which migrates in armies when numerous; and like its near relatives, the surface caterpillars, it may be controlled by means of arsenical sprays when on plants on which these may be safely used. 2 lb. to 3 lb. of lead arsenate in 50 gallons of water makes a suitable application.—*F. J. C.*

Arsenate of Lead, Analyses of. By P. Rankin Scott (*Journ. Dep. Agr. Vict.*, December 1909, p. 753).—The analyses of fourteen samples are given. All the samples were found true to name, and little

or no soluble arsenite was present. Comparing the analyses, the moisture contents vary considerably in most cases; a high moisture content is accompanied by a low percentage of arsenic acid. The samples varied from 22·2 per cent. up to 73·3 per cent. moisture; from 18·87 to 44·06 per cent. lead oxide; from 7·80 to 14·70 per cent. arsenic oxide. The average analysis of the fourteen samples gives 45·81 per cent. moisture; 35·46 per cent. lead oxide; 12·17 per cent. arsenic oxide. In England at present Swift's arsenate of lead is most used for spraying; its analysis gave 44·6 per cent. moisture; 37·28 per cent. lead oxide; 15·23 per cent. arsenic oxide; 0·35 per cent. water-soluble arsenic.

A Bill has been prepared for United States Congress providing that arsenate of lead shall be deemed to be adulterated if it contains more than 50 per cent. of water; total arsenic equivalent to less than 12½ per cent. of arsenic oxide; or soluble arsenic equivalent to more than 0·75 per cent. of arsenic oxide. Water-soluble arsenic should be low, as the danger of burning leaves is due to this, while the arsenic oxide, the killing property to caterpillars, should be high. Arsenate of lead is a useful destroyer of slugs and snails on plants that are not used for food.—*C. H. H.*

Arsenical Sprays, Guides in the Use of. By C. J. Carmody (*Jour. Dep. Agr. Vict.*, September 1909, pp. 584-589).—(*a*) No preparation should be used as a general spray without first testing it on a tree (or portion of a tree) of the different varieties to be treated, unless the grower has had previous experience with that particular brand.

(*b*) Some varieties are more susceptible to arsenical influence than others, 'Bismarck' being the most noticeable in this respect in the author's experience.

(*c*) Weak, stunted, water-logged trees are less resistant to burning than young vigorous ones.

(*d*) In moist or foggy weather this spray is far more injurious than when the weather is warm and equable.

(*e*) Water used in mixing the sprays should be free from any acids that will act as a solvent on the arsenic.

(*f*) Vessels, pumps, nozzles, hose, etc., should be thoroughly clean, and free from Bordeaux mixture or any active agent that would cause mechanical or chemical changes to take place.

(*g*) The safest sprays are those having the least amount of soluble arsenic in their composition.

(*h*) The spray should be continuously and thoroughly agitated from the bottom of the pump up to the surface.

(*i*) Repeated spraying with arsenic, when not wholly insoluble, often sets up a kind of chronic derangement of the cellular tissues of the leaves not at first noticeable, but which causes the leaves to prematurely turn yellow and fall off.

(*j*) Extreme care should be exercised with the handling, storing, and application of these sprays. They should not be used at the

ripening stage of the fruit, nor for some time previous to its being plucked from the trees.—*C. H. H.*

Asplenium microtum. By W. R. Maxon (*Contr. fr. U.S.A. Herb.* xii. (1909); pt. 9; plate).—A fern included by Dr. Christ under *A. Trichomanes*, collected by Dr. Henry at Mengtse, Yunnan, at an altitude of 6,000 feet.—*F. J. C.*

Atmospheric Impurities and Vegetation. By Prof. J. B. Cohen and A. G. Ruston (*Gard. Mag.* No. 2928, December 11, 1909).—In a lecture on this subject at the Leeds Health Congress the authors pointed out that the blackening of vegetation was due to the tarry matter in soot, which is very great in industrial districts. More damage, however, is done by sulphurous fumes, which sometimes, in the form of sulphuric acid, amount to as much as 10 parts per 100,000. Timothy grass was grown in boxes and watered with water containing very small quantities of sulphuric acid. Growth was immediately checked, the plants soon turning yellow and dying.—*E. B.*

Bacterial Diseases of Plants. By Walter G. Sackett (*U.S.A. Exp. Stn. Colorado, Bull.* 138; January 1909).—This bulletin calls attention to some of the more common bacterial diseases of plants which are either present in the State or may be expected in the future. Where remedies are known they have been suggested, but for the majority of bacterial diseases no efficient treatments have been discovered, and prevention is the only hope. .

The diseases mentioned are: Bacterial Disease of Alfalfa, p. 4; Pear Blight, p. 6; Soft Rot of Sugar Beet, p. 14; Black Rot of Cabbage, p. 15; Blight of Potato, Tomato, Egg Plant, and Tobacco, p. 19; Bacteriosis of Beans, p. 21; Wilt of Cucumber, Cantaloup, and Squash, p. 22.—*V. G. J.*

Beet-sugar Industry in 1908, Report on (*U.S.A. Dep. Agr., Rep.* 90, June 1909).—A report on this industry in the United States from the commercial side.

Hints are given in a short section on the management of the crop and on the latest machines in use for the subsequent manufacture of the sugar, but the paper consists chiefly of accounts of the relative importance of the crop in the different States, and of comparative tables of the production of beet-sugar in America and in Europe.

M. L. H.

Begonia 'Patrie.' By S. T. Grignan (*Rev. Hort.* Sept. 16, 1909, pp. 426-428; 2 illus. and col. plate).—Described as somewhat similar to 'Gloire de Lorraine,' but of more compact habit and denser inflorescence. The foliage is larger, colour deeper, and cultivation much easier. According to the coloured plate, a very desirable acquisition in winter-flowering begonias.—*C. T. D.*

Big Trees of California (*U.S.A. Dep. Agr., Div. Forestry, Bull.* 28, 1900).—A most interesting illustrated account of the *Sequoia*

gigantea—a tree that has attracted a good deal of notice on this side of the Atlantic. The discovery of the original trees, places where they are found, the immense size to which they have attained, and methods of conversion are all fully explained, while the beautiful illustrations serve a most useful purpose in elucidating the text.—*A. D. W.*

Bindweed, The Eradication of. By H. R. Cox (*U.S.A. Dep. Agr., Farmers' Bull.* 368, Aug. 1909; plates).—This name has been applied to several species of the Convolvulus family, which are very aggressive weeds, doing much harm over a wide area to cultivated crops and occasionally in orchards. The best method of dealing with it is to keep down the top growth and thus starve out the underground parts, and this is best done in three ways—by clean cultivation, by lucerne growing, and by hog pasturing.

Other methods have been tried, but so far not with much success. Figures are given of types of weed-cutters which have been found useful in exterminating bindweed in America.—*M. L. H.*

Biological Studies on Three Species of Aphididae. By J. J. Davis (*U.S.A. Dep. Agr., Bur. of Entom., Tech. Bull.* 12, part 8; Feb. 1909).—Studies of the various stages, times of appearance, and so on, of three species of *Aphis* which attack maize and sorghum are given at length, together with a bibliography of each species.—*F. J. C.*

Birch Stem, Sap-pressure in the (*Bot. Gaz.* vol. xlviii. December 1909, pp. 442-458; with 5 figs.).—Messrs. H. E. Merwin and Howard Lyon found that the sap-pressure in both birches and maples increases rapidly in amount from the morning until midday, or shortly afterwards; it then slowly declines until sunset, after which a gradual rise is maintained during the night. The sap-pressure is, however, extremely sensitive to sunshine; it drops suddenly if a cloud obscures the sun, and rises again in sunlight. The maple is not nearly so sensitive. The highest pressures observed were 91 cm. (1·2 atmosphere) in a birch 7·5 cm. diameter, and in another 35 cm. diameter and about 20 m. high 204 cm., corresponding to 2·68 atmospheres. Such a pressure would support a column of water 7·8 m. higher than the tree. These high pressures occur when the buds are beginning to unfold, and no pressure is found in spring till the ground has thawed considerably.

By a series of ingenious experiments and calculations the authors found that the evaporation from one tree amounted to about 480 ccm. a day; that the duct space in a white birch, 11 cm. in diameter, amounted to about 6,800 ccm., and that about 1·3 to ·7 per cent. of this internal duct space was occupied by gas bubbles.

The authors calculated also the amount of expansion of the wood due to a rise in temperature, and find that this expansion produces the rise in pressure from sunrise to noon, as well as the oscillations noticed in sunshine and cloud alluded to above. The ratio of expansion

from 6° to 32° C. of cell-wall to the expansion of water was found to be 2·2.—*G. F. S.-E.*

Bordeaux Mixture made with Lime-water. By D. McAlpine (*Jour. Dep. Agr. Vict.*, November 1909, p. 702).—A form of Bordeaux may be used in which lime-water takes the place of the milk of lime. Less bluestone is necessary, and the solution is equally efficacious. The formula is:

Bluestone	3 lb. 2 oz.
Lime-water	42½ gallons.
Water to make up to	50 gallons.

The lime-water may be prepared by placing the quicklime (2½ lb.) in a gunny bag (or any bag of loose texture will do) and suspending it in the proper quantity of water in the morning, and next morning it will be ready for use. It may be run off into the bluestone solution, and after thorough mixing it is ready for spraying.—*C. H. H.*

Breeding, Application of Some of the Principles of Heredity to Plant. By W. J. Spillman (*U.S.A. Dept. Agr., Bur. Pl. Ind., Bull.* 165, 67 pp.).—The author first gives a description of Mendelian phenomena, referring to the work of English experimenters, and to much of the recent literature upon this subject. Other section headings are Latency, Reciprocal Crosses, Mutations, etc. The whole constitutes a convenient *résumé* of the work of recent years in experimental eugenics and its bearing upon the work of practical breeding.

E. A. Bd.

Breeding: The Superiority of Line Breeding over Narrow. By O. F. Cook (*U.S.A. Dept. Agr., Bur. Pl. Ind., Bull.* 146, pp. 1-40).—"Line" breeding is the term applied when strains are descended from single individuals propagated without interbreeding with other lines of descent.

"Narrow" breeding is applied to the propagation of small numbers of closely similar individuals.

A closely detailed discussion leads to the following conclusions:—

"Line" breeding is best suited for the raising of a product to a high degree of uniformity and is termed "conservative."

"Narrow" breeding is the condition in which degeneration most promptly takes place, and is "destructive."

The practical importance of uniformity must not lead the breeder to overlook the fact that it is attained at the price of degeneration. It is recognized, however, that no single system can be applied to the whole field of experimental breeding, owing to diversity of conditions, and especially to variations in protoplasmic longevity.—*E. A. Bd.*

Bromeliaceae, Morphological Changes in Roots of, Due to Attack of Heterodera. By James Waterston (*Trans. Roy. Bot. Soc. Edin.* vol. xxiv. part i. pp. 26 to 34; 3 plates).—An account of the

influence exerted by the parasitism of nematode worms in roots of certain of the Bromeliaceae. Reference is made to the work of Vuillemin and Legrain, who state that at El Oued (a Saharan oasis) the presence of *Heterodera* is necessary for the cultivation of beetroot in that climate, and that the relation must be regarded "comme une véritable symbiose."

The main part of the paper is occupied with a description of the remarkable morphological changes induced by the presence of *Heterodera* in the roots of certain Bromeliads, and is an important contribution to the literature of parasitism.—*E. A. Bd.*

Broom-rape. By T. W. Kirk, F.L.S., and A. H. Cockayne (*Dep. Agr. N.Z., Bull.* 21; Feb. 1909; 4 figs.).—The illustrations show the various stages of development in the broom-rapes, which belong to the genus *Orobanche*, and all are true parasites, never producing foliage-leaves or chlorophyll, but obtaining all their nourishment from the host plant. The seeds of the broom-rape are almost the smallest that are produced by any flowering plant; they are very long-lived, and may remain dormant for as long as ten years.

The authors suggest several methods of prevention and extermination, and recommend that in paddocks where the parasite is troublesome only those plants should be grown which are known to be free from attack. A list of host-plants is appended.—*V. G. J.*

Burseraceae. By A. Guillaumin (*Ann. Sc. Nat.* x. Nos. 4, 5, 6, pp. 202-301; 62 figs.).—This family includes *Crepidospermum*, *Protium*, *Tetragastris*, *Trattinickia*, *Canarium*, *Canariellum*, *Pachylobus*, *Dacryodes*, *Santiria*, *Scutinanthe*, *Aucoumea*, *Triomma*, *Boswellia*, *Bursera*, *Commiphora*, *Garuga*, *Canariastrum*. The leaves, stem, fruit, embryo, and germination are described of all but the last. The two characteristics of the family are the presence of secretory canals in the primary liber formed in the procambium, and the existence of two ovules in the cell of the ovary. The Burseraceae are closely related to the Rutaceae, Anacardiaceae, Meliaceae, and Simarubiaceae.

S. E. W.

Cabbage Growing. By E. R. Bennett (*U.S.A. Exp. Stn. Colorado, Bull.* 143, March 1909).—As land in Colorado has been irrigated, the character of the crops grown has changed, and cabbages, potatos, and onions have taken the place of wheat, oats, and hay. The best situation for cabbages is an altitude of between 6,000 and 9,000 feet. Irrigation is necessary when setting out the young cabbage plants in the field, and the ditches are only filled in after two or three applications of water have firmly sealed the plants in. The flea-beetle is the most serious insect pest, attacking the seedlings, which are therefore grown in covered frames. The alkaline character of the soil may have something to do with the very small amount of club-root, even though cabbages are grown continuously on the same soil—in one case fourteen years in succession.—*C. H. L.*

Cabbage, The Decay of, in Storage: its Cause and Prevention. By L. L. Harter (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 39; Oct. 1909).—The loss from decay of cabbage in winter storage has increased to such an extent in some districts in the past few years as frequently to make the growing of the crop an almost unprofitable industry. Of the thousands of tons stored every fall to supply the markets in winter from 10 to 50 per cent. is lost annually from decay.

Soft rot and leaf-blight are found to be the immediate cause of the trouble. The organisms that promote these decays gain access to the tissues of the leaves through wounds made by careless handling, and also by following up the fibro-vascular bundles which have been previously killed by black-rot in the field.

The author advises that diseased or badly-bruised cabbage should not be stored, and attention should be paid to the ventilation of storage-houses, which should be kept as dry as possible.

If a house has been previously used for storage purposes, and there has been any evidence of decay, spraying the interior with about half 1 per cent. solution of copper sulphate or the application of whitewash will destroy the spores of many fungi and bacteria. The application of either should be made long enough before the house is used for storage to permit the wood to dry thoroughly.—*V. G. J.*

Calcium v. Magnesium and Sodium (*Bot. Gaz.* vol. xlix. pp. 41-50, January 1910; with 2 figs.).—Mr. Chas. B. Lipman finds that there is no antagonism between either magnesium or sodium and calcium. Any combination of the first and last is more toxic than $MgCl_2$ for *B. subtilis*. Similarly, any combination of sodium and calcium is more poisonous for this bacillus than NaCl alone. In this respect *B. subtilis* differs from all other plants hitherto studied.

G. F. S.-E.

Camassia Leichtlini. By W. Fitzherbert (*Garden*, Sept. 11, 1909, p. 446 and fig.).—This is particularly recommended for the wild garden. Two varieties are mentioned. The writer also describes *C. esculenta*, *C. Cussickii*, *C. Fraseri*, *C. montana*, and *C. Brownii*; he considers they should be planted in colonies. They do not produce many offsets, but may be raised by the thousand from seed, flowering in their fourth or fifth year.—*H. R. D.*

Cambium Starvation in Trees. By K. Rubner (*Nat. Zeit. Land-Forst.* viii. pp. 212-262; April 1910).—Many variations in external form of trees may be traced to low activity of the cambium layer which forms new wood and inner bark. A number of cases have been investigated by the author, and he has succeeded in grouping them into series. The ribbing of the stem so conspicuous in trees like Hornbeam and Yew is traced to poor growth of parts of the cambium, while neighbouring parts grow vigorously; the year-ring is thus unequally developed. In other cases ribbing may be due to excessive bark formation. When the growth of the whole cambium ring is

retarded, as in the case of suppressed trees in a wood, or trees stripped of their foliage by insects or frost, then there results a year-ring which is uniformly thin and starved. Other cases of cambium starvation may result from throttling of the stem—*e.g.* by wire fastened round it, or by ringing due to animals. The paper is an important contribution to the physiology of timber.—*W. G. S.*

Campanula Beauverdiana. By C. H. Wright (*Bot. Mag.* tab. 8299). Nat. ord. *Campanulaceae*; tribe *Campanuleae*. Transcaucasia and Northern Persia. Herb, glabrous. Leaves oblong-ovate, 2¼ inches long. Flowers solitary or few. Corolla blue, wide campanulate.

G. H.

Catalpa Midge (*Cecidomyia catalpae*, Comstock). By H. A. Gossard (*U.S.A. Exp. Stn. Ohio, Bull.* 197; October 1908; 9 figs.).—The midge attacks the leaves and seed pods, but the most conspicuous form of injury is that done to the terminal buds of two- and three-year-old trees in the nursery beds. Usually two or three inches of the tender growing tips wither and turn brown, ultimately turning black and shrunken. When opened they are found to contain several small, yellow, footless maggots.

The eggs are apparently deposited in the stem at the base of the petiole, or in the petiole base itself, and the stem begins to die at this point. In one small block of two-year-old catalpas about 25 per cent. of the trees had been injured. In nearly every case the lateral buds, at the last joint below the point of injury, had attempted to produce a leader, which resulted in a crooked, forked stem.

The illustrations show the injured buds, injury to seed-pods, spots on the leaves, and the adult female midge with eggs and larvæ.

Among the remedies an application of kainit is recommended to destroy the hibernating larvæ and stimulate the trees.—*V. G. J.*

Celery Growing in Colorado. By L. J. Reid (*U.S.A. Exp. Stn. Colorado, Bull.* 144, March 1909).—Celery is chiefly grown in the river-bottom lands. The farms are small, and heavy manuring takes the place of regular crop rotation, with careful irrigation. Two varieties are grown—Golden self-blanching and Giant Pascal. Blanching is done by means of boards (expensive), earthing up, and also with paper wrappings, finished off by earthing in trenches. The greatest drawback in celery-growing is a tendency in the maturing plants to go to seed. It is supposed to be caused by "frosting" when the plant is young, or a check in the way of drought, or poor quality in the plants set out.—*C. H. L.*

Centipede, The Common British. By W. Wesche, F.R.M.S. (*Knowledge*, November, 1909, pp. 419-420; 9 figs.).—This familiar animal, which is apparently sensitive to light, although without eyes, is described in detail, and its place in the animal kingdom pointed out. Reference is made to the alleged poison sac and appurtenances,

comparison being made with some of the exotic centipedes which are poisonous to man. Our British species is harmless to man, and is generally regarded as a useful ally of the horticulturist.—*W. A. V.*

Cereus nudiflorus. By J. N. Rose (*Contr. fr. U.S.A. Herb.* xii. (1909); pt. 9; pp. 397-398; 3 plates).—This cactus, which forms a tree 22 feet in height, has been rediscovered in Cuba. The species was referred by Schumann to *C. lepidotus*, and the name *nudiflorus* (of Engelmann) does not appear in *Index Kewensis*.—*F. J. C.*

Chenopodium amaranticolor (*Jour. Soc. Nat. Hort. Fr.*, Sept. 1909, p. 517).—M. Bois has introduced this plant, which is recommended as a useful, very fast-growing vegetable, to take the place of summer spinach.

It does not flower early enough, however, to set seed in the climate of Paris.—*M. L. H.*

Chermes. By O. Nüsslin (*Nat. Zeit. Land-Forst.* viii. pp. 65-105; Feb. 1910).—Students of this group of insects will find this a useful paper summarizing recent progress, which has been rapid. The author is a well-known authority on the group, especially on the Spruce *Chermes*, and he gives an excellent summary of the systematic arrangement as now known. Life-histories of the better-known forms are also given, and there is an analytical table for determination of the more important species, with numerous figures.—*W. G. S.*

Chestnut-bark Disease, Present Status of the. By H. Metcalf and J. F. Collins (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 141, pt. v. Aug. 1909).—Caused by the fungus *Diaporthe parasitica*, the chestnut-bark disease has of late done a considerable amount of damage to both old and young trees in and around the city of New York. Methods of coping with the disease and some illustrations of affected trees are given.—*A. D. W.*

Christmas Rose, Transplanting the. By E. H. Jenkins (*Garden*, Sept. 11, 1909, p. 445).—This should be done in September, transplanting in spring being a "delusion and a snare." The Christmas rose produces two sets of roots each year—the main or basal roots in the early autumn, and lateral or fibrous roots in the spring with the coming of the new leafage. It is important to procure the principal set of roots if the secondary are to exist at all or exercise their proper functions. The main roots are brittle, and, if mutilated, often decay to the base of the plant. By the destruction of these main roots in spring planting a debilitated condition is set up. The plants should never be transplanted bodily in large specimens. The best way to divide a clump is to lay it on its side and insert two small hand forks, back to back; then divide the clump by wrenching them outwards in opposite directions. Plants with two or three crowns are the best for planting, and division to nearly single crowns every two or three years has been found successful.—*H. R. D.*

Chrysanthemums, Hairy. By Viand Bruane (*Rev. Hort.* Dec. 16, 1909, pp. 565-567; 4 illus.).—The illustrations show four distinct varieties in which the hairy or bristly superficial growths in the petals characteristic of a section exhibited in 1889, of which 'Mrs. Alpheus Hardy' formed the initial type, are very manifest, especially in 'Professeur Desiré Bois,' an incurved variety, orange red. 'Professeur Noel Bernard' is a very dwarf variety of the same section, very double flower, petal backs rose-silvered and bristly, upper surface red. 'Barbe blanche,' also dwarf, white, light yellow in centre, passing into white as developed. 'Perruque blonde,' petals wide, long, and much curved, buff and ochry red. Very curious.—*C. T. D.*

Clematis mandschurica. By F. Morel (*Rev. Hort.* Sept. 16, 1909, pp. 422-423; 1 illus.).—The illustration from a photograph represents a very handsome and floriferous bush which is densely covered with pure white flowers in May and June, and if not allowed to seed will flower again in August and September. Is not a climber. Flowers delicately perfumed.—*C. T. D.*

Codling Moth. By J. E. Buck (*U.S.A. Exp. Stn. Virginia, Bull.* 181, March 1909; 9 figs.).—Data collected in 1908 showed about 43 per cent. of the apple crop of Virginia to be affected by codling worms. Experiments conducted in the same State and year resulted in 85 to 98 per cent. of worm-free apples from the trees dealt with. The life-history of the insect is given as observed there, showing the first brood of moths to emerge throughout May and a second brood during July and August, and it is estimated that 70 per cent. of the first-brood larvæ enter the apples at the calyx, and the majority of the second-brood larvæ at the side of the fruit. As the temperature conditions seem to govern both the opening of the blossom and the appearance of the first moths, it is recommended that the first spraying should be done within a week after the petals fall, and a second two to three weeks later. For the second brood it is recommended to spray nine weeks after the petals fall. Arsenate of lead and Paris green were used in the experiments, and the former proved the more efficient.—*A. P.*

Coelogyne Mooreana. By R. A. Rolfe (*Bot. Mag.* tab. 8297). Nat. ord. *Orchidaceae*; tribe *Epidendreae*. Annam. Herb, pseudobulbs clustered. Leaves 10-20 in. long. Scapes erect, 12-16 in. long. Flowers white, lip with golden blotch, 3 in. across.—*G. H.*

Coffee Tree (*Gymnocladus dioicus*) (*U.S.A. Dep. Agr., Forest Service, Circ.* 91, April 1907).—The coffee tree (*Gymnocladus dioicus*) in an economic sense is evidently of great value for the quality of the timber it produces, which is used to a limited extent for cabinet work and perhaps more largely in fencing, being durable when brought in contact with the soil.—*A. D. W.*

Coniferae at Baden-Baden. By R. Arens (*Die Gart.*, No. 2, p. 14; January 8, 1910).—In the much colder winter climate of Germany there are very few of even the most common evergreen trees or shrubs that survive the rigour of winter. There are, however, a few spots where the protecting hills and sometimes also the nearness of the lakes mitigate the severity of the season, and some plants having the benefit of a little varying warm summer for well ripening the wood, and the longer retarding though not very cold winter preventing early growth, do very well. *Cunninghamia chinensis*, a splendid specimen, almost faultless, of 11 metres height, and a spread of branches of 10 metres. The circumference of stem one metre from the ground is 1·90 metre. *Cedrus atlantica glauca*, *Cryptomeria japonica*, *Picea pungens glauca*, and several others, which can be grown only in other parts of Germany under cover.—*G. R.*

Cool Storage of Fruit. By W. French (*Jour. Dep. Agr. Vict.*, September 1909, pp. 589-592). — After describing varieties, keeping qualities, and temperatures, it gives the following as the length of time fruit can be stored:

Peaches—one to two months at 32° to 34° F.

Plums—Eight to ten weeks at 32° F.

Cherries—ten to fourteen days at 32° to 34° F.

Oranges—One to three months at 34° F.

Lemons—four months at 38° F.

Grapes—three months at 33° to 36° F.

Strawberries—four weeks, if covered with cotton wool, at 32° F.

Currants—four to six weeks at 32° to 34° F. Red varieties keep better than black or white, and should be protected by paper covering.

Tomatos (ripe)—one to two months at 42° F.—*C. H. H.*

Copper-soda for Apple Scab. By J. Cromin (*Jour. Dep. Agr. Vict.*, September 1909, p. 588).—The best time to spray is when a few of the blossoms are opening and the bulk of the flower buds are showing with distinct stems. Copper-soda is probably as effective as Bordeaux mixture under all circumstances. It certainly is so in districts where the weather conditions are fairly dry at the blossoming period. Bordeaux mixture, owing to the lime in it, adheres to the trees better than the other wash, and is preferred where heavy rains occur in spring. The difference in cost is that between the soda and the lime. Only positively fresh lime is serviceable, so that some waste usually ensues. The copper-soda is more easily mixed and applied, and is a much more pleasant mixture to use generally. The accepted proper mixture for copper-soda wash is made thus: dissolve 6 lb. bluestone in 25 gallons water, in which it should be suspended (placed in a piece of hessian). In cold water it will dissolve in a few hours; if required quickly, it dissolves in a few minutes in boiling water. Dissolve 8 lb. of washing soda in the same manner in another vessel containing 25 gallons water; when dissolved add evenly together into the spray barrel.—*C. H. H.*

Coral Spot Fungus (*Garden*, Oct. 2, 1909, p. 485).—This is the well-known fungus found on dead wood. When the spores first germinate they are incapable of attacking living tissue, and can only grow on dead wood; but when once it has gained an entrance to dead wood the mycelium will spread to and kill adjacent living tissue. It is therefore well to keep the fungus in check, and not leave dead wood lying about where it may do harm.—*H. R. D.*

Cornfield Ant, Lasius niger americanus, Habits and Behaviour of. By S. A. Forbes (*U.S.A. Exp. Stn. Illinois, Bull.* 131; Dec. 1908; 1 plate).—This ant, which is nearly related to a common British species, does harm in maize fields in two ways—directly in some seasons by hollowing out seeds, and so either killing them or reducing the amount of reserve food at the disposal of the young plants; and indirectly by keeping aphides which prey on the roots of the plants. It is shown that a change of crop, from maize to some other upon which the aphides do not feed, is followed by a migration of the ants, provided weeds are kept down. Numerous notes on life-history, etc., are given.—*F. J. C.*

Corn-root Aphis, Experiments with Repellents against. By S. A. Forbes (*U.S.A. Exp. Stn. Illinois, Bull.* 130; *Dec.* 1908).—The experiments detailed were carried out in 1905 and 1906, and, while not conclusive, show the possibilities of using repellents with success. The only natural agency checking this pest, which is closely connected with the cornfield ant, is a long-continued soaking of the ground by frequent heavy rains, especially in the spring. A test was carried out with a large number of substances possibly useful for the purpose, to ascertain their influence upon the germination and subsequent growth of the plants. Four were selected, and the seeds treated therewith before using—viz. oil of lemon, carbolic acid, formalin, and kerosene, and all in the order named insured a larger yield than the untreated seeds. The author considers, however, that much larger numbers of experiments are necessary. Rotation, thorough cultivation, and proper manuring, as well as the use of repellents, are the methods to be adopted in dealing with this pest.—*F. J. C.*

Cotton, Egyptian, A Study of Diversity in. By O. F. Cook, Argyle McLachlan, and Rowland M. Meade (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 156; 6 plates).—The diversity shown in introduced Egyptian Cottons is divided into four classes:—

(*a*) Owing to insect cross fertilization.
(*b*) Owing to incomplete acclimatization.
(*c*) Differences in physical environment.
(*d*) Differences existing in the same individual.

A detailed description of the three varieties imported—viz. Jannovitch, Mit Afifi, and Dale—is given, and it is evident that neither of these is a pure strain

Some evidence is given of the changes attributed to incomplete acclimatization, but it is hardly of a conclusive nature; and the same may be said of the variations grouped under class *c*, of which even less evidence is offered.

Cases are quoted of lack of uniformity in the individual plant, but the greater part of the paper deals with the characteristics of the various hybrids, and the impurity of the strains reported upon render it impossible to draw any conclusion as to the effect of environment upon them.—*E. A. Bd.*

Cotton, Local Adjustment of Varieties. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 159, 1909).—A lengthy and detailed account of variation induced by changing of locality in cotton plants. A distinction is drawn between merely local changes and acclimatization of foreign cottons. The general deterioration of cotton due to local changes is due to an increase of diversity in individual plants.

The saving of seed from plants which have not been disturbed by the environmental change is advocated. The conclusion drawn from the facts is that in testing new varieties in new districts time must be allowed for local adjustments before any conclusion can be reached as to suitability.

This is a paper of close and detailed evidence, and its nature renders adequate abstracting difficult, if not impossible.—*E. A. Bd.*

Cotton, Suppressed and Intensified Characters in Hybrids of. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 147, pp. 24).—The author considers that heredity comprises two processes—viz. transmission and expression of characters. "Extra-parental" characters are divided into three classes—suppressed, intensified, and primitive.

Mechanical theories of heredity are dismissed, as "plants and animals inherit from their parents and transmit to their descendants large numbers of peculiarities which are not shown in their own bodies." Details of two of the classes mentioned above are given.

No. 1. Suppression of bractlets in a cross between two bracteated varieties.

No. 2. Intensification of bracts in certain crosses.

These changes are said to be most pronounced in the first generation, and tend to disappear in later generations.

This paper is of much interest, but the difficulty of sundering changes due to environment from those due to hybridity is very apparent. No evidence is offered of the stability of the varieties used, and in view of the author's remark on local diversities in *Bull.* 159 of this Bureau, this omission renders the evidence somewhat inconclusive.

E. A. Bd.

Cucumber Beetle, The Striped (*Diabrotica vittata* Fab.).—By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 31; May 1909; 2 figs.).—A revised edition of a previous circular. The

author gives minute details regarding the life-history, food plants, and methods of prevention and destruction. Among the latter he advises sifting road dust or ashes over the majority of the plants, and covering the remainder with an arsenical solution. The beetles will concentrate on the clean plants, where they will be killed by the poison.
V. G. J.

Cyclamens, The History of the. By Le Texnier (*Rev. Hort.*, Sept. 1, 1909, pp. 408-411).—A very interesting account of the genus and the development under cultivation of the various species and varieties concerned.—*C. T. D.*

Delphinium sulphureum (=D. Zalil). By F. Roll (*Die Gart.*; April 30, 1910, p. 209).—Although this is the only species of hardy herbaceous *Delphinium* with yellow flowers, and though of far greater elegance than the white or blue flowering *D. formosum* forms, it is rarely met with in gardens. It does best in a light soil and warm sunny position. The only way to increase it is by seeds which are best sown as soon as ripe. The rootstock is tuberous, not unlike that of *Aconitum*. During a cold wet summer the flowers are of a rather pale yellow, but in warm dry weather they are of a uniform golden yellow, quite as large as those of the best blue Delphinium of our gardens, and of graceful habit.—*G. R.*

Dewberry Growing. By O. B. Whipple (*U.S.A. Exp. Stn. Colorado, Bull.* 136; Jan. 1909).—Some parts of Colorado, especially those with a summer temperature of 90° and from 5,500 to 6,500 feet high, grow very good dewberries. In one plantation three-quarters of an acre yielded 345 crates, and a gross return of over $650. But over-production is possible on account of the speedy deterioration of fruit in marketing; it must be on the market within thirty-six hours after picking. The plants require to be covered during the winter (with soil), but, given protection and good cultivation and manure, the life of the dewberry plant is a long one. In shipping the crates of berries, ventilation seems more important than refrigeration.—*C. H. L.*

Dioon spinulosum (*Bot. Gaz.* vol. xlviii. December 1909, pp. 401-413; with 7 figs.).—Professor Charles J. Chamberlain gives an excellent photograph and a fresh description of this rare Cycad, and also discusses the distribution, character of the cones, and affinities of the three species of this genus.—*G. F. S.-E.*

Dipelta ventricosa. By J. Hutchinson (*Bot. Mag.* tab. 8294). Nat. ord. *Caprifoliaceae*; tribe *Lonicereae*. Western China. Shrub 7-18 feet high. Leaves ovate. Flowers axillary, pedicellate. Bracts 6, 2 very small, 4 large at base of ovary. Corolla 1¼ inch long, red without, orange within.—*G. H.*

Dipsaceae. By P. van Tieghem (*Ann. Sc. Nat.* vol. x. Nos. 1-3, pp. 149-200).—Comparison of the inflorescence, flowers, fruit, and seed shows a wide difference between the Valerianaceae and the Dipsaceae.

The Dipsaceae contains only five genera, viz. *Dipsacus*, *Cephalaria*, *Knautia*, *Pterocephalus*, and *Scabiosa*. *Morina*, formerly included in this family, should in all probability be a member of a new family embracing *Moriaceae*, *Trilostegia*, and *Hoeckia*, or form, together with *Acanthocalyx*, a new division.—*S. E. W.*

Diseases of Cereals and Grasses (*U.S.A. Exp. Stn Ohio, Bull.* 203, April 1909; plates).—These investigations were undertaken in order to try to discover the cause of the shrivelling which has often been noted in wheat grains without the presence of attacks of rust severe enough to account for the phenomenon. Experiments were made with the apparatus known as a physician's centrifuge, which was found to answer the purpose admirably of detaching disease spores from affected grain, and was the means of discovering the existence of a hitherto unrecognized Anthracnose disease which attacks rye, wheat, oats, and various grasses.

The organism causing this disease has been provisionally given the name of *Colletotrichum cereale*, and its life-history was studied upon its natural hosts and in standard culture media in the laboratory, the similarity of colony, form and size of spores, colour and appearance of mycelium being apparent in all these growths.

The spores of this disease are readily disseminated through seed-grain, as is shown by the results of centrifugal examinations made of the washings from suspected grain. Seed treatment with formaldehyde drench will destroy the Anthracnose spores; and during the growing season formaldehyde, hot-water and corrosive-sublimate treatments, which were being tried for smut, were found to check the Anthracnose disease also.

Further investigation of this disease is, however, to be undertaken by the Department with the co-operation of private growers. This bulletin also contains information upon the wheat scab, *Fusarium roseum* (Lk.), and gives the results of cultivation of the spores of its probable perithecial form, *Giberella Saubinelli* (Mot.) Sacc. upon culture media. The work done demonstrated that the scab fungus not only survives in dead wheat kernels, but also in those capable of germination. Germinations of externally sterile kernels of wheat have been made in the Geneva germinator, in sterile tubes, and in soil in the greenhouse. All these tests proved that the scab fungus (*Fusarium*). under such conditions, was an aggressive seedling parasite attacking and killing the young wheat plants when less than a month old. Clover, oats, barley, rye, and spelt are also affected by an apparently identical fungus. Some plots of wheat at the station were infected with washings of wheat, oats, barley, rye, the grain of which had showed an abundance of scab conidia under centrifugal micro-examination, and it appeared that, no matter which of these was the source of the conidia, infection of the wheat readily took place. On the practical side, it is pointed out that stinking smut, scab diseases, and Anthracnose have all been found present in seed-grain, and there-

fore seed treatment by means of formalin is urged, while the feasibility of removing scab-infested kernels by thorough cleaning of the seed-grain in the fanning mill is shown by the investigations made as to the relative weight of healthy and infected kernels.—*M. L. H.*

Diseases, Plant, in Florida. By H. S. Fawcett (*U.S.A. Exp. Stn. Florida, Rept.* 1908).—Bacterial rot of cabbage (*Pseudomonas campestris*) and of lettuce (causing browning of the leaf and subsequently rotting) are fully described, and a few others incidentally referred to. In the case of the former, which is sometimes prevalent in England, it is recommended that fresh soil should be used for seed beds; the seeds should be wetted with a solution of 1 part of corrosive sublimate to 1,000 of water for 15 minutes; fresh ground should be chosen for planting; the use of stable manure should be avoided; infected plants should be burnt; tools should be properly cleansed and disinfected after digging in infected soils.—*F. J. C.*

Distribution of Chlorogenic Acid in Nature. By K. Gorter (*Ann. Jard. Bot. Buit.* viii. series ii. pp. 69-84).—Chlorogenic acid is decomposed by caustic alkalis into caffeic and quinic acids, $C_{32}H_{38}O_{19} + H_2O = 2C_9H_8O_4 + 2C_7H_{12}O_6$. Hydrochloric acid decomposes chlorogenic acid, with evolution of carbonic acid and the formation of a product soluble in ether. The etherial extract gives a characteristic violet solution when shaken up with a dilute solution of ferric chloride. By means of this reaction, the presence of chlorogenic acid has been detected in 98 of the 230 species examined. It could not be detected in any of the Leguminosae and Meliaceae.—*S. E. W.*

Drosera ornata. By H. P. (*Garden*, Nov. 27, p. 576 and fig.).—The Australian sundew is worthy of note as an ornamental flowering plant. It is from 6 to 8 inches high, and the flowers tall. When fully exposed to the sun, the leaves and translucent drops often become reddish. It is readily propagated by root cuttings.—*H. R. D.*

Dry Farming Investigations in Montana. By Alfred Atkinson and J. B. Nelson (*U.S.A. Exp. Stn. Montana, Bull.* 74, Dec. 1908).—The conclusions reached in this bulletin are that dry farming may be carried on with profit on much of the great level area of the State which will never be irrigated. Autumn-sown wheat and rye answer better than spring-sown, and the crops should be grown in alternate years with a well-cultivated summer fallow, which will keep down weeds and promote a mulch surface for retention of moisture.

C. H. L.

Echeveria. By J. N. Rose (*Contr. fr. U.S.A. Nat. Herb* xii. (1909); pt. 9; p. 395; figs.).—Two new species from Guatemala, *E. guatemalensis* and *E. Maxonii*, are described and figured.—*F. J. C.*

Echeveria carnicolor Baker. By J. N. Rose (*Contr. fr. U.S.A. Nat. Herb.* xii. (1909); pt. 9; p. 393; fig.).—This plant was described

and figured in Saunder's *Refugium Botanicum*. It has now been rediscovered in Mexico by Dr. Purpus, and may prove useful in the garden. It is near *E. lurida*, but more attractive.—*F. J. C.*

Education, Agricultural, Progress in 1907. By D. J. Crosby (*U.S.A. Dep. Agr., Off. Exp. Stn., Ann. Rept.* 1907; pp. 237-306; figs.).—Gives a brief account of the courses proved in different parts of the world for agricultural and horticultural education.—*F. J. C.*

Eelworm in Leaves of Greenhouse Plants (*Garden*, Sept. 25, 1909, p. 470).—The occurrence of eelworm in leaves of begonia, especially 'Gloire de Lorraine,' and fern leaves is noticed. The injury is seen as brown marks on the under surface, or showing through the leaf. In the begonia the brown spots have a curious semi-transparent appearance and are frequently put down to rust. Mites are sometimes the cause of injury, but very often the microscope reveals instead innumerable eelworms (*Aphelenchus olesistus*). It gains entrance to the plant through the roots, making its way up the stem to the leaves Take precautions to see that the soil is free from the pest and propagate only from healthy plants.—*H. R. D.*

Elaeagnaceae, Monograph of. Second Part. By M. Servettaz (*Beih. 3, Bot. Centralbl.* Band 25, Abt. 2, Heft ii. Oct. 9, 1909, pp. 129-420; 140 figs. and bibliography).—In this volume are described the biology, comparative anatomy, and embryology of the order. (The First Part contains a systematic account of all the known species.) It is very difficult to give an adequate account of this important work, for there is hardly a stage in the life-history of a plant, from the germination of the seed to the maturing of the fruit, that is not thoroughly described, not only anatomically but with continual references to experiments and physiology, in this paper.

There are many points of great interest to horticulturists. The three genera, *Hippophaë*, *Shepherdia*, and *Elaeagnus*, seem to prefer rather moist, loose, and argillo-siliceous soils, but the last-named is more accommodating and grows in many soils, though not in limy ground. *Hippophaë* is of great use in fixing river-shingles, gravelly land, or even sand dunes (as at Ostend), and soon ties down the shifting material by its system of branching roots. Suckers may be planted at three or four yards apart; the accumulation of vegetable soil is much favoured by burning the bushes every third or fourth year in late autumn or early spring. The number of thorns and spinescence generally depends essentially on the action of the environment, as the author shows by microscopic evidence and by his experiments; there are other interesting notes as to the effect of altitude, of a dry climate, of culture, and of growth underground, in altering the anatomical structure of stems, roots, and leaves. He considers that *H. tibetana* Schlect. and *H. salicifolia* Don are only subspecies of *H. rhamnoides*, produced by the very different climates in which these species are

found (the first grows at over 12,000 feet in Tibet, and the second on the warm and humid slopes of the Himalayas).

The peculiar nodosities or swellings on the roots of Elaeagnaceae are apparently distinctly of service to the plant; the author's experiments showed that plants inoculated with extract of other nodosities were much more vigorous than those which were not so treated.

The pollen of *Hippophaë* is carried by ants, which visit aphides on the plant, but also and especially by the wind. *Elaeagnus*, which forms flowers in winter and even when covered by snow, is able to pollinate itself, but is usually fertilized by insects.

The fleshy fruit of *Hippophaë is* relished by birds, but the author found that all the seeds were destroyed in the gizzard of the "geai" (? jay or jackdaw) which was kept by him, and he doubts the importance of this method of distribution, although he admits that the presence of *Hippophaë* in many isolated places (as on the railway talus at Perrignier) is best explained by bird-distribution. Usually the fruit dries on the tree during winter and falls off in spring. (The pulp hinders or prevents germination.) The fruit is able to float for long distances in consequence of the air being retained between the seed and the membranous sac formed by the ovary.

Variegation in *Elaeagnus* is considered as caused by disease.

There is a discussion of the affinities of the family and some interesting remarks on the physiological part played by calcium oxalate, tannin, and eleagnine in the economy of the plant.

Most of the book is taken up with the comparative anatomy of roots, stems, and leaves, but including the primary and secondary structures, growing points, development of flower, pollen-sac, embryo-sac, fertilization, development of embryo; in fact, every part is described microscopically and illustrated by excellent figures.

The classification adopted is that of Van Tieghem and Bonnier. It is impossible to abstract these details. One should, however, mention that complete keys are furnished by which one can discover the species of *Elaeagnus* or *Shepherdia* merely by the anatomy of the stem, or of the leaf or of the root. Perhaps the most interesting part of this section is the clear description of the development of the characteristic stellate hairs of the order and of the fruit of *Hippophaë*.—*G. F. S.-E.*

Electricity and Micro-Organisms. By G. E. Stone (*Bot. Gaz.* xlviii.; Nov. 1909; pp. 359-379; 2 figs.).—In order to test the influence of electric currents on the growth of bacteria, the author used wide-mouthed jars (21 cm. by 10 cm.) stoppered with cotton-wool and containing strips of copper and zinc (4 cm. wide). These electrodes were placed in the jars against the side and connected by copper wire. Under the influence of the current so produced (0·1 milliampère) the number of bacteria per cubic centimetre increased from about 3000 to 43,000 on the first day and 108,000 on the second day. In similar jars not stimulated the number was only 3463 on the first and 3435 per c.cm. on the second day.

Cultures of Alfalfa bacteria (*Pseudomonas radicicola*) and of *Bacillus megatherium* also increased enormously under electrical treatment. With a current of ·3 milliampère colonies of the first-mentioned increased to over 5,000,000 on the eighth day (control 50,217), and of the second to 7,650,000 on the fifteenth day (control 32,000).

But with this method zinc oxide increases in the jars and eventually poisons the bacteria.

A large increase of bacteria in milk was also obtained by a current of ·3 milliampère. This amounted to over 94,000,000 and over 83,000,000 per c.cm., whilst in milk not stimulated the increase was not more than 7,000,000 and 6,000,000 per c.cm. Static electricity was also used with milk bacteria. Thus, on June 11, three similar jars with milk contained 8342 bacteria per cubic centimetre. On June 15, one which was not electrified contained 9,876,000 per c.cm.; the second, charged with one spark (positive), contained 70,500,000; and the third, with one spark (negative), 79,600,000 per c.cm.

But with higher charges (such as 100 sparks every hour, or three times a day, or even once only) the bacteria were injuriously affected. With the higher charges, in fact, the number of bacteria was reduced from 219,250 per c.cm. to 481 (positive charge) and 266 (negative charge) in five hours, whilst in the untreated jar the number had increased to over 1,000,000. Still, even with the heaviest charges, it was not found possible to suppress micro-organisms. The author states, however: "Undoubtedly the use of strong electrical currents is capable of destroying bacteria and preventing milk from deteriorating," and "in some tests made of electrically treated milk we found that souring was delayed."

Positive charges (static electricity) were found to stimulate the growth of bacteria more decidedly than negative ones; the same difference had been noted by the author in experiments on the growth of seedlings.

In another experiment the author used boxes of fairly good loam (8 × 8 × 8 inches) in which electrodes (strips of zinc and copper 8 × 8 inches) were placed at either end and connected by copper wires. Unfortunately the number of bacteria diminished in these boxes, but by a greater amount in those boxes which were not electrified. In another case static electricity was used (twelve wires brought to a similar box and attached to a metal bulb on a Töpler-Holtz machine, which was given 100 sparks once a week). In this case the bacteria in the electrically treated soil increased from 4,506,700 per gm. to 27,756,000 in seven days, whilst in the untreated soil they only increased from 1,097,290 to 1,960,780 per gm.

Other experiments on yeast showed that, under the influence both of static and galvanic electricity, a larger amount of carbonic acid was given off by electrified yeast.

In one case in four days (galvanic treatment) 1200 c.cm. of CO_2 were given by the electrified, and only 50 c.cm. by the control yeasts. The latent period lasted usually from 15 to 25 minutes; it was followed

by a considerable acceleration in gas-production. A charge of one or two minute sparks from a Leyden jar seemed to cause the most active response on the part of the yeast.

The optimum current for the germination of seeds and the growth of seedlings, as well as for micro-organisms, is, in the author's opinion, not far from 0·1 milliampère.

"Minute currents of electricity exist in plants, and it is known that during certain periods trees discharge sparks from the apices of the leaves, and trees may tend to equalize differences in potential between the earth and air."

"Electricity, like other forms of stimulation, undoubtedly affects the protoplasm of the plant, which causes certain metabolic processes to become active, and accelerated growth results."

It will be seen that this paper is of great interest to the many who are now experimenting with electrical gardening.—*G. F. S.-E.*

Eremurus Elwesianus. By E. A. Bowles (*Garden*, Nov. 6, 1909, p. 543).—This is vigorous in constitution; a mulch of manure in early spring helps vigorous growth, but it is best to wait till the shoot is well through the ground before applying it. The method is described by which the plant secures cross-fertilization.—*H. R. D.*

Eremurus robustus. By Rev. F. Page Roberts (*Garden*, Oct. 23, 1909, p. 518).—Lifting every three years, or annually if the soil is inclined to be wet, is advised. It is beneficial to keep the plants out of the ground two or three weeks.—*H. R. D.*

Eria rhodoptera. By R. A. Rolfe (*Bot. Mag.* tab. 8296). Nat. ord. *Orchidaceae*; tribe *Epidendreae*. Philippines. Herb, with pseudo-bulbs. Leaves 4½-10 in. long. Scapes erect, 5½-7 in. long. Racemes many flowered. Flowers pale straw or white, with crimson petals and side-lobes of lip.—*G. H.*

Femlinde in Dortmund (*Die Gart.*; February 5, 1910, p. 68).—This old tree of the Linden (*Tilia vulgaris*), the age of which is surmised to be over a thousand years, has to be removed; the principal part, a mere old shell, to the museum, and a small tree, probably a layer, to another public place. Under the old tree the old courts of the Holy Fem (or Vehm) were held, that secret tribunal which Walter Scott has described in his *Anne of Geierstein*.—*G. R.*

Ferrous Sulphate, Relative Toxicity of, for Barley and Rye Seedlings. By B. L. Hartwell and F. R. Pember (*U.S.A. Exp. Stn. Rhode I.*, 21*st Ann. Rept.* part 2; (1908); pp. 286-294).—The presence of iron sulphate (ferrous sulphate) appears to act adversely upon the seedlings of barley and rye to about the same extent, reducing the amount of water transpired and the growth of the plants in both cases considerably, as is shown in the following table.

	Average green weight	
	Barley	Rye
Without ferrous sulphate	100	100
$\frac{N}{2500}$ ferrous sulphate	76	71
$\frac{N}{1250}$ ferrous sulphate	59	56

The amount of depression in weight was nearly equal to that produced by the addition of sulphuric acid of equal strengths, and it seems probable that the suggestion made by Boiret and Paturel (*Ann. Agron.* vol. xviii. (1892), p. 417-440) that the adverse action of ferrous sulphate on growth is due to the liberation of sulphuric acid as the salt passes to the ferrous condition is the true one.—*F. J. C.*

Fertilizing Value of Hairy Vetch for Connecticut Tobacco Fields. By T. R. Robinson (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 15; October 1908).—Preliminary facts were published in 1905 in regard to "a new and valuable cover crop for tobacco fields," namely, Russian or hairy vetch (*Vicia villosa*). This legume was found to be resistant to cold, heat, and drought; occupied the ground during the fall, winter, and spring; decayed rapidly when turned under, and enriched the soil by its ability to "fix" or utilize atmospheric nitrogen when properly inoculated—that is, when the bacteria were present to cause the formation of root nodules. Unless the bacteria were artificially supplied it was found that nodule formation was lacking or very tardy. "The roots of plants from inoculated seed bore many tubercles, some aggregations of them being as large as corn kernels. When the seed was not inoculated the roots bore few, if any, nodules, and the growth of the plants was much less vigorous" (*Conn. Agr. Exp. Stn. Bull.* 149, p. 6). The present circular deals with the necessity of inoculating the seed, as where hairy vetch has been inoculated and an abundance of root nodules have resulted the tobacco following has been greatly benefited both as to yield and quality. Tables are given showing results of experiments with inoculated and uninoculated hairy vetch.—*V. G. J.*

Forestry Conditions in Ohio. By W. J. Green and E. Secrest (*U.S.A. Agr. Exp. Stn., Ohio, Bull.* 204, June 1909).—The conditions of forestry in Ohio are encouraging, and the account of the various species of *Catalpa* must be read with pleasure by those who are interested in the growth of the tree in this country. There is an exhaustive list of the principal forest trees, no fewer than twelve of which are commonly cultivated in the British Isles.—*A. D. W.*

Forestry in the United States, The Status of. By T. Cleveland (*U.S.A. Dep. Agr., Forest Service, Circ.* 167, Sept. 1909).—A valuable account is given of what is being done both by the State and private persons in the matter of forest extension. Three-fourths of the forests are in private hands.—*A. D. W.*

Freesia History. By Rev. Joseph Jacob (*Garden*, Dec. 4, 1909, p. 590).—The first to come to this country was *Freesia repanda*, introduced in the early part of last century and figured in "Bot. Reg.," t. 135. It seems to have been neglected for many years. Next came *F. Leichtlini*, found by chance among some neglected pots by Max Leichtlin in the botanic garden at Padua. It was shown by Dr. Wallace in April, 1875, who, three years later (1878), obtained a F.C.C. for *F. refracta alba*. In 1882 Messrs. Sutton introduced an improved form, *F. refracta major*. The same firm introduced some pink varieties in 1907. The work of Dr. Attilio and Van Tubergen is also noted. F. H. Chapman, beginning in 1904, has chiefly worked on the yellow forms.—*H. R. D.*

Fruit Trees, Pruning Mature. By O. B. Whipple (*U.S.A. Exp. Stn., Colorado Agr. Coll., Bull.* 139, *Feb.* 1909; 15 figs.).—This bulletin deals with the pruning of the hardy fruits grown as orchard trees in Colorado—apples, apricots, cherries, peaches, pears, plums, and quinces—particularly with regard to the forming of the shape of the tree and its fruiting habit, with the influence of these two upon each other. As all food material capable of healing a wound takes a downward course through the inner bark, the author points out that to heal well a wound must be in a position to intercept this flow of sap from foliage higher up, and maintains that wounds heal best when made at a season of the year when growth is most active, advising the postponing of winter pruning until as near the opening of the growing season as possible. The thinning of the fruit is also dealt with, being regarded as a form of pruning, and it is held that even spur-bearers like the apple and pear should produce a good crop of fruit buds every year if this is properly attended to, while a thinned tree in two successive years will produce as much fancy fruit as an unthinned tree of both fancy and choice.—*A. P.*

Fruit Trees, Top-working. By O. B. Whipple (*U.S.A. Exp. Stn., Colorado Agr. Coll., Bull.* 147, June 1909; 7 figs.).—Full instructions are given for the top-working of fruit trees, both old and young, by grafting and budding. The author holds that both with undesirable old trees and young ones not true to name it is better to top-work them with other varieties than to plant fresh trees, always assuming that the trees to be worked are in vigorous growth. He thinks that some varieties of apples particularly susceptible to root-rot and woolly aphis could be successfully grown on the roots of varieties which are apparently resistant, *e.g.* 'Northern Spy,' which is usually immune from Woolly Aphis. Scions should be taken from the most satisfactory trees in a plantation of the same variety, and when working an old tree no more limbs should be cut away than is necessary for the setting of sufficient scions to ensure a good top, cutting away the remaining branches the two following years.—*A. P.*

Fruit Trees, New Varieties of, Want of Vigour in. By M. Nomblot (*Jour. Soc. Nat. Hort. Fr.* Nov. 1909, p. 679).—

M. Nomblot, in a paper on this subject, mentions first the three ways in which the new varieties which are placed on the market are obtained: (1) By chance seedlings; (2) by sowings made without preliminary fertilization; (3) by sowings made from seeds which have been fertilized on a more or less settled plan. Once raised, the seedlings are not selected sufficiently with a view to their individual healthiness, and the methods of cultivation to which they are subjected are not always calculated to produce a good constitution in the specimens.

Further, in perpetuating good varieties, either by graft or cutting, every available shoot is liable to be made use of, whether thoroughly healthy or not.

M. Nomblot, in a second paper (p. 680, Nov. 1909), gives directions for the raising of young fruit trees from seed and for the treatment best calculated to produce healthy stock.—*M. L. H.*

Fruit Trees, Young, Advantage of Importing from Different Soil and Climate (*Jour. Soc. Nat. Hort. Fr.* Nov. 1909, p. 680).—Opinion on this subject is still divided, but the debate here recorded ended with the conclusions that, if it is not actually proved to be an advantage to plant trees which have been raised in a different soil and climate, at all events the acclimatization of such trees need present no difficulties, and, in any case, it is better to attempt it than to go on reproducing a variety indefinitely under the same uniform conditions.—*M. L. H.*

Fungi, Gravity and the Growth of (*Bot. Gaz.* vol. xlviii. December 1909, pp. 414-426; with 13 figs.).—Miss Stella G. Streeter found that when young and vigorously growing toadstools (*Amanita phalloides*) are placed horizontally the stipe bends upwards and carries the pileus up to and beyond the horizontal position. Then, by a subsequent change in growth-direction, the horizontal position is obtained. The sensitive zone is situated near the tip of the stipe, and the zone of most rapid elongation is always just below the pileus. The reaction follows sometimes after less than a minute's stimulation, and the latent period varied from 40 to 60 minutes.—*G. F. S.-E.*

Fungicides, Copper. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S. (*Woburn, Eleventh Report*, 1910).—As the fungus and the host plant upon which it lives are both vegetable organisms built up of similar cells, they will probably be affected in the same way by any deleterious substance applied to them (p. 3), and the authors of this report state that "no direct fungicidal action is possible without the risk, and, indeed, almost the certainty, of some damage to the plant." "The rate at which insoluble copper is rendered soluble, and the strength of the solution existing at any time in the form of droplets on the leaves, must always be unknown quantities, which will vary with the varying atmospheric conditions at the time" (p. 9). Damp, muggy weather, mainly by causing a rapid liberation of soluble copper, is the most conducive to injury (p. 101), which consists of the destruction of protoplasm.

In fungicides of the Bordeaux type the copper is insoluble at first, but becomes gradually soluble later on; and it is held that the dissolving agent is usually and mainly, with the aid of moisture, the carbon dioxide of the air (p. 11), and not often substances excreted by the fungus itself or the leaves of the host plant (p. 106), while the action of the fungicide is regarded as due in part to the permeation of the leaves by the soluble copper, and in part to the coating of copper carbonate on the outside of the leaf (pp. 4 and 112). Better results are obtained from substances insoluble to start with than from those consisting of compounds of copper already in a soluble form (p. 181). It is a fallacy, however, that the presence of any soluble copper in a spray should be avoided (p. 7).

The Woburn Bordeaux, the making of which was described in the Eighth Report (p. 9), is now estimated to be twelve times as efficient as ordinary Bordeaux (p. 59). The latter, when dry, is not satisfactory as a substitute for a freshly prepared solution, but it is now possible to obtain the Woburn mixture, or another basic sulphate analogous to it, in the form of paste, and at a cost considerably less than that of the copper sulphate alone which the grower would have to use to make Bordeaux of the same efficiency in the ordinary way. This paste simply requires mixing with water at the rate of about 15 pounds to 100 gallons to reproduce a substance which, as regards the copper compound present in it, is absolutely identical with that of a freshly-made preparation (p. 183).

In the making of ordinary Bordeaux the lime should be as weak as possible (p. 50), any increase of this ingredient tending to delay and diminish fungicidal action without materially reducing the risk of injury when the scorching action of lime itself is taken into account (pp. 16 and 185). Experience is tending towards a reduction in the strength of the mixture, the usual formula recommended now being 9½ pounds of copper sulphate and the same amount of lime to 100 gallons of water p. 185). The prevalent idea that Bordeaux does not begin to act for some days after its application has been disproved (p. 186), though the effects may not become visible at once. The addition of treacle to the mixture is not recommended, as it results in a liquid of very variable strength (p. 80). Bordeaux mixtures should not be kept in tinned-iron vessels, some, especially Woburn Bordeaux emulsion and paste, acting on these metals and becoming rapidly decomposed (p. 48). Growers have in many cases scorched the foliage of their trees by the use of Bordeaux emulsion when sent out in tin canisters (p. 70).

When buying a fungicide it should be remembered that its efficiency is not to be estimated by the amount of copper contained in it, but by the amount which becomes soluble and therefore available for fungicidal action (p. 6). It is likewise irrational to judge of its value by the amount of deposit left on the leaves.

Numerous experiments on scorching and fungicidal action are detailed in the report (p. 116 *et seq.*), and it has been found that the scorching action of different salts of copper is independent of the nature of the salt taken, and depends solely on the quantity of copper present

(p. 158). Negative results were obtained by adding substances to copper fungicides to increase their power of wetting leaves, but they afforded an excellent illustration of the danger of adding any substances to such mixtures without a proper scientific examination of the changes which they may bring about (p. 159).—*A. P.*

Ginkgo, Stamens of (*Bot. Gaz.* vol. xlix. pp. 51-55, January 1910; with 1 plate).—Miss Anna M. Starr finds that the older stamens are at the base, and that the development of the microsporangium is probably like that of the Cycads. The way in which the mucilage ducts "in the hump" are formed may indicate that the stamens of Ginkgo developed from a peltate type, like those of Taxus.

G. F. S.-E.

Grape-leaf Skeletonizer, The. By P. R. Jones (*U.S.A. Dep. Agr., Bur. of Entom., Bull.* 68, part 8; Jan. 1909; figs.).—The insect dealt with is a small moth (*Harrisana americana*, Guér.), which lays its eggs in clusters on grape leaves, and the larvæ destroy the soft tissue of the leaf by advancing in regular order over the surface, feeding as they go. An arsenical spray is recommended, but the best means of prevention is clean cultivation.—*F. J. C.*

Grasses, Comparative Anatomy of the (*Beih. Bot. Centralbl.* xxv. 2 Abt. Heft iii., pp. 421-489; December 1909; with 17 figs.). —Professor Ernst H. L. Krause attempts in this paper to use the anatomical structure in grasses as an aid to the naming of species, and claims that over two thousand species may be readily brought into their tribes and distinguished by his classification.

Reference must be made to the original for the system adopted and the microscopic details described.—*G. F. S.-E.*

Grasses, Sand-binding. By T. W. Kirk and A. H. Cockayne (*Dep. of Agr. N.Z., Leaf.* 79, Feb. 1909; figs.).—One of the duties which devolve upon the inhabitants of New Zealand is the protection of the islands from the dangers of drifting sand. Their three thousand miles of coast are, as a whole, slowly rising, but this rising causes immense masses of sand to be washed up, which the wind, if powerful and persistent enough, carries far inland over large tracts of otherwise rich arable land. To check this invasion of sand it is necessary to use various native and exotic sand-binding grasses.

Of these the most valuable is the Marram grass (*Psamma arenaria*), a European grass which roots at every point, extends rapidly, and, being almost totally unnutritious, is not eaten down by herbivorous animals. It also possesses the great advantage of quietly giving place to grasses of more intrinsically valuable character as the settled and fertilized sand becomes gradually suited to their growth.

The other sand-binders in use are the foreign *Elymus arenarius*, which has not the advantage of giving way to other vegetation as the Marram grass does, and the native *Spinifex hirsutus* and *Scirpus frondosus* (Cyperaceae).—*M. L. H.*

Guava Jelly. By J. Belling (*U.S.A. Exp. Stn. Florida, Rept.* 1908; pp. 105-109).—Experiments were carried out as to the best method of making guava jelly. A recipe for its making (for which the original should be consulted) is given.—*F. J. C.*

Gypsy and Brown Tail Moths. By Wm. Stuart (*U.S.A. Exp. Stn. Vermont, Circ.* 2; Mar. 1909; figs.).—These two troublesome European insects have spread to all the New England States except Vermont. They are figured and methods of dealing with them are detailed. See previous abstracts.—*F. J. C.*

Hyacinths, Propagation of. By Piet Ammerlaau (*Gard. Mag.* No. 2916, September 18, 1909; figs.).—Four very clear and interesting illustrations explain two systems by which one hyacinth bulb is made to produce bulblets to the number of sixty or even eighty in one season. The bulblets have, of course, to be grown on to flowering size, but the method of reproduction is simple and very rapid.—*E. B.*

Hydrocyanic Acid in Green Plants, Rôle of. Part III. By M. Treub (*Ann. Jard. Bot. Buit.* viii. series ii. pp. 85-118; 6 plates).—Hydrocyanic acid is the first recognizable product of the assimilation of nitrogen, and is perhaps the first organic nitrogenous product to be formed.—*S. E. W.*

Injurious Insects. By Fabian Garcia (*U.S.A. Exp. Stn. New Mexico, Bull.* 68; Aug. 1908; figs.).—This is a popular bulletin dealing with the various insects commonly proving injurious in New Mexico. No new information is contained.—*F. J. C.*

Inoculation of Beans, &c. By H. Garman (*U.S.A. Exp. Stn. Kentucky, 19th Rept.* (*Bull.* 125); 1906; figs.).—Experiments on different soils with cultures of nodule bacteria are reported, both dry and moist cultures being tried. The yield was not greater from the inoculated than from the untreated plots and was sometimes less.

F. J. C.

Iris minuta. By O. Stapf (*Bot. Mag.* tab. 8293). Nat. ord. *Iridaceae;* tribe *Irideae.*—Japan. Herb, dwarf and densely tufted. Leaves 18 in. long. Rootstock creeping and branching, with numerous slender tuberculated roots. Perianth 1-1¼ in. across, yellow.—*G. H.*

Juncaceae, A New Parasitic Disease of the. By E. J. Schwartz (*Ann. Bot.* xxiv. 1910, p. 236).—Notes the occurrence of an attack in the roots of *Juncus* of a species of *Sorosphaera.* There is no hypertrophy; infection takes place by means of an amoeba through the root hairs. A full account of the parasite, which is named *S. junci,* is promised later.—*A. D. C.*

Leaf-position and Decapitation. By F. Bäfsler (*Bot. Zeit.* lxvii. 1 Abt. Heft v.-vii. pp. 67-91; July 1909).—When a stem is

decapitated by the removal of the growing-point the leaves change their position, rising or becoming more upright, so as to make a greater angle with the horizon. In some experiments this angle of the petiole or leaf increased by as much as 40° to 50°, but usually by about 10° or 20°. Only younger leaves or those near the growing-point are affected; when an axillary bud develops, as often happens, the reaction ceases.

The petioles show this movement on decapitation of the stem even when the leaf blade is cut off. The reaction is not affected by light and only influenced, not caused, by gravity. Injury to the growing-point (such as vertical or horizontal incisions) or the enclosure of it in gypsum does not produce the same effect as decapitation.

The author considers that the reaction is not caused by "Wundschok," nutrition, gravity, or light, but that it is due to some unknown stimulus.—*G. F. S.-E.*

Leaves and Light (*Bot. Gaz.* vol. xlviii. December 1909, pp. 459-461; with 1 fig.).—Mr. Joseph Y. Bergen finds (as pointed out by Wiesner) that the upper leaf-surface is in many plants concave for those exposed to sunlight, and not nearly so much so in those that are in shade. The sun leaves of a begonia, *e.g.* were at an angle of from 23° to 56°, whilst the shade-leaves were at 108° to 180°. Other measurements are also given.—*G. F. S.-E.*

Legislation to Protect against the Introduction of Insect and Fungus Pests into Victoria (*Jour. Dep. Agr. Vict.*, September 1909, pp. 593-602).—"The Victorian Potato Industry: The Inter-State Conference and the Irish Blight," by T. Cherry, Director of Agriculture. An original account of "The Potato Murrain," with illustrations taken from the "Illustrated London News" of August 29, 1846, is given. The importance of the export trade, conditions favourable to disease, the steps to be taken, and resolutions of the Conference are fully discussed. When once a disease is established, its eradication becomes a matter of great difficulty. The soil may become infected; the remains of one season's crop may carry on the infection to the next year; the micro-organism may betake itself to allied plants, and it may be transferred from one district to another by all kinds of unsuspected ways. Knowledge of the life-history of the exciting cause may place us on the track of the right means to prevent it, but the conditions of life of both the disease and the plant it attacks are so complicated that caution has to be exercised in drawing conclusions from any set of experiments. A farmer very often talks as if slight differences in the soil of one part of his farm, or a few weeks' extra dry weather, were solely responsible for this or that result. As a matter of fact, no kind of experimental work is so uncertain as that which deals with plants and animals. The difference existing between *living* and *dead* things is so profound that insignificant variations in any respect may make unexpectedly great differences in the final result.

The moral of which is that no farmer can afford to neglect the smallest detail when he is dealing with any question of disease.

To meet the present emergency in the potato business the hearty co-operation of every potato-grower in Victoria, whether his plot is a few yards square or his farm contains 100 acres of potato land, must be secured. (1) Only clean seed should be used, and this must come from districts which are known to be free from disease. In addition to this, all seed must be cut and soaked in formalin (1 lb. to 30 gallons of water for a period of two hours) or other antiseptic. (2) All potatos, without any exception whatever, for the next two seasons should be grown on new land. (3) In future years a more systematic rotation of crops should be carried out. (4) Spraying.

The Government of Victoria has determined that a fair share of the cost of eradicating the disease will be defrayed by the Department. By means of the assistance that can be rendered by the staff of the Department it is highly probable that a farmer can be safely piloted through a dangerous period with a minimum of expense. New bags or cases should be used for seed potatos. Rejected seed should be placed in a barrel and boiled before feeding to pigs.

New ground and rotation with peas and clover are insisted on. Then follow twenty-four resolutions of the Inter-State Conference of Ministers of Agriculture regarding the transfer of potatos, fruits, vegetables, and plants.—*C. H. H.*

Legumes, Native, in Nebraska and Kansas, Notes on the Number and Distribution of. By J. A. Warren (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 31, June 1909).—Nature teaches that the growth of grasses cannot be kept up without a corresponding growth of leguminous plants. Thus it is that amongst wild plants a quarter to three-quarters are leguminous, and on large areas of uncultivated land (notably in Maryland) the leguminous plants are unobtrusively doing their work in preparing the soil and opening the way to cultivated crops. Hence the necessity of including legumes in crop rotations even on rich lands.—*C. H. L.*

Lemons, Italian, and their By-Products. By G. H. Powell and E. M. Chace (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 160; Oct. 1909; parts 1 and 2; 6 plates, 5 figs.).—Part 1 describes the Italian lemon industry, and some very interesting facts are given concerning the methods of cultivation. The lemon is budded or grafted on the stock of the bitter orange (*Citrus Bigaradia*), which grows wild in Sicily and in the mountains of Calabria, and is now used universally as a stock on account of its resistance to the gum disease, which devastated the groves of Sicily thirty years ago, when the trees were propagated on lemon stock.

Part 2 deals with the by-products of the lemon, citrate of lime or calcium citrate being the most important. This is an intermediate product in the manufacture of citric acid. Citric acid is not made in

Italy. The citrate of lime is exported to different countries, there to be converted into the acid.—*V. G. J.*

Lenticels, Exuberant Formation of, in Oak Seedling. By Bertha Chandler (*Trans. Roy. Bot. Soc. Edin.* vol. xxiv. part. i. pp. 35 and 36; 1 plate).—The presence of an excessive water supply to seedling oaks caused the abnormal lenticel formation figured.

E. A. Bd.

Light and Heat, Influence of, in the Production of Organic Matter in Tea Plants. By J. Bosscha (*Ann. Jard. Bot. Buit.* viii. series ii. pp. 66-68).—A relation exists between the clearness of the sky and the amount of growth of the leaves of the tea shrubs. The clearness of the sky was judged by the daily difference between the minimum and maximum temperature. This is termed the amplitude of temperature.—*S. E. W.*

Lilies. By E. H. Jenkins (*Garden*, Sept. 4, 1909, p. 429).—*L. candidum* is a sun lover, and shallow planting should be practised. It may be planted near trees with excellent results, especially near yew, holly, or pine, which show up the purity of the blossoms. The drier conditions frequently found in such places are a material help in keeping the lily disease in check. Some bulbs weakened by disease were planted at the foot of a laburnum and allowed to become covered with London pride; they had given moderately good spikes each year.

L. testaceum possesses some affinities with *L. candidum*. *L. Hansoni* should be planted where there is shelter from cold winds and strong sunlight; it is the better if the root run is in comparative dryness. It and the forms of *L. auratum* are at home in the root companionship of other plants; they are particularly benefited from association with rhododendrons. Lilies without stem-roots — *e.g.* *L. chalcedonicum* and the swamp lilies—are usually slow to become established.

L. Henryi should be staked and tied low down, and afterwards allowed to go its own way.—*H. R. D.*

Lilium candidum, Disease in. By Mrs. L. M. (*Garden*, Sept. 18, 1909, p. 455).—A bad attack was cured by digging up the bulbs, burning the worst, and keeping the rest in a bag of sulphur for six weeks before replanting.—*H. R. D.*

Lilium nepalense. By A. M. (*Garden*, Oct. 9, 1909, p. 491).—At Ambleside this lily does well if taken up directly it has flowered, put into a box (not pot), and wintered in a cold frame.—*H. R. D.*

Lime and Sulphur. By P. J. Carmody (*Jour. Dep. Agr. Vict.*, September 1909, p. 586).—Lime, 20 lb.; flowers of sulphur, 15 lb.; water, 50 gallons. Slake the lime in about 20 gallons of water, and add the sulphur, previously mixed up into a stiff paste, to the slaking lime. The whole mixture should be boiled for one hour in an iron

kettle over a fire, keeping well stirred all the time, after which the full quantity of water may be added and then promptly applied before the sulphides are lost by cooling and crystallization. Material should be strained and thoroughly agitated. To increase adhesiveness, 2 or 3 lb. of salt may be added.—*C. H. H.*

Lime Sulphur, Self-boiled. By P. J. Carmody (*Jour. Dep. Agr. Vict.*, September 1909, p. 586).—Lime, 10 lb.; sieved sulphur, 10 lb.; water, 50 gallons. Place lime in barrel and pour on enough water to start it slaking, about six quarts. Then add the sulphur, and finally enough water to slake the lime into a paste. Keep well stirred, and after the violent boiling ceases the mixture should be diluted ready for spraying. Five to fifteen minutes are required for the process, according as the lime is quick-acting or sluggish.—*C. H. H.*

Magnolia glauca. By E. Riebe (*Die Gart.*, April 30, 1910, p. 205).—A rapid-growing, very hardy species, a native of the United States. The best plants were usually found in damp, marshy ground. Although deciduous in fairly sheltered positions, it is quite evergreen. The leaves are glaucous green, and the flowers, which are less conspicuous than those of *M. Yulan*, appear late in the summer, and are very fragrant. *Magnolia Yulan* var. *conspicua*, an early flowering, very showy plant, is also described and illustrated.—*G. R.*

Magnolia grandiflora and its Varieties. By W. D. (*Garden*, Sept. 4, 1909, p. 432).—In the Midlands and North this is grown as a wall plant, but farther South does well in the open. It should be planted in its permanent quarters when quite small, as it is impatient of root disturbance. Seven varieties are described, *M. g. gloriosa* being by far the most beautiful.—*H. R. D.*

Mango. By J. Belling (*U.S.A. Exp. Stn. Florida, Rept.* 1908; pp. 110-125; plates).—It is pointed out that mangos have, like the orange, more than one embryo in their seeds, and that in some cases the egg-cell does not produce an embryo. The extra embryos are developed from the nucellar tissue, and are therefore of the nature of buds, and likely to reproduce the characters of their one parent true.— *F. J. C.*

Manures and Manuring. By J. J. Willis (*Gard. Mag.* No. 2927, December 4, 1909).—In view of the probable exhaustion of natural deposits of manures in the near future the production of artificial manures is a question of great importance. Two such manures are now being prepared in quantity and are known as Calcium cyanamide, or "lime nitrogen," and "basic nitrate of lime." The former is a black powder containing 20 per cent. of nitrogen, equal to 24 per cent. of ammonia. The latter is a brownish compound containing about 13 per cent. nitrogen and 25 to 30 per cent. lime. Both are soluble in water and should form valuable plant foods.—*E. B.*

Meadow Formations and the Steppe Period in Alsace. By Prof. Ernst H. L. Krause (*Bot. Zeit.* lxvii. Abt. 1, Heft viii., ix. Aug. 1909, pp. 141-173). The oecology of the Vosges mountains and of the valleys from Basel to Strassburg is described. The author finds that there are two formations: first, what he classes as heath, which is characterized by *Calluna* and *Vaccinium* (including *Nardus* association); and, secondly, a less uniform meadow formation (*Wiesen*) which merges into *Phragmites* and other reed associations in wet places, and in drier situations becomes a "*Hartfeld*" or "*Hartheath*," characterized by ***Andropogon ischaemum.***

Nehring's hypothesis of a Steppe period during the Pleistocene, at which time a continuous Steppe, with the characteristic plants and animals, is supposed to have extended from the Black Sea to Upper Germany and France, is severely criticized by the author. There is no proof that the climate of that time was either warmer or drier than it is in the same districts to-day, although it may certainly have been warmer and drier than in the glacial epochs which preceded it. Even now the author shows that there is not so very much difference between the climate of the Black Sea Steppes and that of the district alluded to. Such plants as *Stipa pennata*, *Eryngium campestre*, &c., which occur in Alsace, are not necessarily, though they may be, relicts of a Steppe flora.

The vegetation of the supposed Steppe period would be a transitional stage between the tundra-like fields of the Arctic regions and the Northern forests.

Then he thinks that woods spread over almost the whole country, though it could not be absolutely continuous forest, for there would always be open spaces due to local climatic or physical causes (rock, altitude, &c.).

Man seems to have appeared in Upper Germany at least four thousand years before any botanical examination of the flora was carried out. But numerous American plants are firmly established in Europe after only a few hundred years, so that he considers that the supposed Steppe relicts may either have been introduced or spread naturally from the Black Sea region during this long period, or may even have lived on in the forest clearings and open spaces. There is no proof, in his opinion, that a continuous Steppe extended from the Black Sea to Upper Germany.

Briquet's Xerothermic period belongs to the last Palaeolithic age (La Madeleine), and the warm period in Sweden (Gunnar Andersen) belongs to the Neolithic age, when man had already settled in Alsace.

A great number of species occur to-day both in the "Black Earth" districts of Russia and in Alsace, and Steppe species are found in wooded districts much colder than Germany.

The differences in the flora of the Russian Steppes and Alsace are explained as due partly to the colder winters of the Steppes, but especially because the salt found in the soil does not exist in Germany. The meadow formations of Alsace are derived from freshwater marsh and the grasslands of the Black Earth, or from salt swamps.

The author has also some interesting remarks on heather, or heath, which survives in places where it would not pay either to cultivate or afforest. When left alone and protected from grazing, these heaths would be overgrown by forest or wood, and partly at least develop eventually into moor (*i.e.* peatmoss). Such a moor, when it had increased in height to a certain level, would be annexed by heather overgrowing the dead sphagnum, and again be covered by wood.

The sub-alpine plants characteristic of the Vosges agree best with those of the Pyrenees; there are fewer of them on the Alps, and still fewer in the Black Forest. The *Hartfelds* are without question former woodlands on which ruderal plants have established themselves.

G. F. S.-E.

Mechanical Tissue in Stems, Effect of Tension on the Formation of (*Bot. Gaz.* vol. xlviii. pp. 251-274; October 1909).—Mr. John S. Bordner gives a short *résumé* of previous experiments dealing with the effect of a pull or traction in developing mechanical tissue in stems.

His experiments are fully explained, and figures are given showing the differences found between the experimental and the control plants in every case.

The results may be perhaps most clearly shown by the following table:—

—	Average Increases per cent. in				
	Breaking Strength	Xylem Area	Cross Section Hard Bast Wall	Number of Hard Bast Elements	Thickness Xylem Wall
Helianthus annuus, greenhouse	57·6	40	16	12·5	—
Helianthus annuus, field	19·6	—	—	—	—
Helianthus annuus, field	5·8	—	—	—	—
Sinapis alba, field	32	−10	52	38	5
Phaseolus vulgaris, greenhouse	33	22	15	—	—
Phaseolus vulgaris, greenhouse	42·5	—	—	14·9	—
Vinca major	15·2	—	—	—	—
Vinca major	18	30	13	—	13
Ricinus communis	6·4	4	—	—	·1 micron
Rubus occidentalis	—	−30	13·6	—	—
Vicia Faba	21	8·3	—	14·8	—
Lupinus albus	—	14	—	11	—

The author concludes that actively growing herbaceous stems do respond to traction along their longitudinal axes by increasing their breaking strength and by the development of mechanical tissue. Internodes which had finished their growth were in two instances unable to respond.—*G. F. S.-E.*

Medicinal Barks, American. By Alice Henkel (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 139, June 1909; plates).—This paper gives a catalogue of the twelve official native American barks—that is, the twelve out of the seventeen recognized in the latest revision of the United States Pharmacopœia, which are furnished by indigenous or introduced trees and shrubs. It also includes the twenty-three other non-official

native barks which appear to be most in demand. To the Latin name of each are added synonyms and the pharmacopœial name, if any, the common name or names, its habitat, range, a description of the tree or shrub, as well as of the bark itself as found in commerce, and information concerning collection, uses, and prices: a warning being added that these last are only meant to give collectors an idea of the range of prices, which are, of course, subject to the fluctuations of the drug market. An illustration is given in the case of most of the species.

M. L. H.

Mexican and Central American Plants. By J. N. Rose (*Contr. fr. U.S.A. Herb.* xii. (1909); pt. 7; figs.).—The results of a botanical journey into Mexico are here described, many new species including *Aquilegia madrensis* from Sierra Madre, four new species of *Ceanothus* (including one, *C. Candolleanus*, which is thought to be the *C. azureus* of De Candolle's Prodromus [2: 31, 1825]), six new Cupheas, some with fair-sized flowers, several new Cacti, and a large number of Lopezias. Plates of *Beaucarnea Goldmanii*, *Echinocactus Palmeri*, *Opuntia azurea*, *O. Lloydii*, and *O. vilis*, accompany the text.—*F. J. C.*

Moisture Content and Shrinkage in Grain. By J. W. T. Duvel (*U.S.A. Dep. Agr. Bur. Pl. Ind., Circ.* 32, July 1909.)—A series of tables showing loss or shrinkage in weight compared with reduction in percentage of moisture, resulting from the drying of grain, the difference between them depending on the quantity of water originally contained in the grain, and the extent to which the drying is carried. This is a fruitful source of trouble between grain merchants and operators of elevators, or commercial grain driers.—*C. H. L.*

Narcissus Engelhearti. By J. Sangster (*Garden*, Sept. 4, 1909, p. 430).—The Rev. J. Jacob, having asked for the experience of growers as to the vigour of this section of Narcissus, his experience with them having been unfavourable (*Garden*, Aug. 21, p. 410), the writer states that he has found 'Gold Eye' to be a poor doer, 'Egret' better, but by no means robust, and 'Moira' "miffy." With these exceptions he considers the group to be satisfactory. 'Incognita,' 'Cresset,' and 'Mars' are specially mentioned as robust.

F. H. Chapman also finds 'Gold Eye' an exception to the otherwise satisfactory character of the group.—*H. R. D.*

New Plants. By J. N. Rose (*Contr. fr. U.S.A. Herb.* xii. (1909); pt. 9; plates).—The following new plants are figured and described: *Pereskia autumnalis* (Rose), a tree up to 30 feet tall from Guatemala; *Opuntia Blakeana*, and descriptions of *O. arizonica* and *O. Toumeyi* from Arizona; *Echinocactus Baileyi*, with large, light purple flowers with yellow stamens from Oklahoma; *Nopalea lutea* from Guatemala (all Cactaceae); *Conzatta arborea*, a shrub with small yellow flowers in slender racemes and large leaves from Mexico.—*F. J. C.*

New Plants from Guatemala (*Bot. Gaz.* vol. xlviii. pp. 294-300; October 1909).—Mr. John Donnell Smith describes new species of *Pithecolobium*, *Appunia*, *Palicourea*, *Parathesis*, *Gonolobus*, *Trichostelma*, *Solanum*, *Athenaea*, *Brachistus*, *Ruellia* (two sp.), *Pseuderanthemum*, *Dicliptera*, and *Justicia*.—*G. F. S.-E.*

Onion Culture. By W. R. Beattie (*U.S.A. Dep. Agr. Farmers' Bull.*, April 1909, 354).—In the Gulf Coast States onions are largely grown, the principal varieties being the Bermuda, Egyptian, and Spanish. The cost of growing these onions is higher than the ordinary and hardier kinds. An acre may cost on an average $80, not including crates. The yield to the acre is about 300 bushels, and the profit, taking one year with another, about $55. The more successful growers count on a net profit about equal to the cost of growing the crop. Supply equals demand at present, but both are increasing. The following is a good fertilizer for general use:—

Sulphate of ammonia (25 per cent.)	200 lb.
Dried blood	300 ,,
Cotton-seed meal	300 ,,
Acid phosphate	800 ,,
Muriate of potash (50 per cent.)	400 ,,

C. H. L.

Onions from Seed. By J. Troop and C. G. Woodbury (*U.S.A. Exp. Stn. Purdue, Circ.* 15; illus.).—Between 3,000 and 5,000 acres are devoted in Northern Indiana to growing onions from seed. They are principally grown in "muck" land—*i.e.* drained swamp—which is 3 to 8 feet deep, fine and black. It is rich in nitrogen and deficient in potash. The use of farmyard manure tends to encourage the onion-maggot; therefore an artificial fertilizer is preferable. The following is recommended:—

1,000 lb. to the acre, containing—

5 per cent. nitrogen,
6 per cent. phosphoric acid,
10 per cent. potash,

with later dressings of nitrate of soda or sulphate of ammonia (Voorhees).

Some of the fertilizer should be placed under the seed in the rows, the remainder broadcast, or between the rows. The great necessity in onion-growing is to keep ahead of the weeds. Hand-weeding essential, but expensive.

The *cost* of growing averages about $75 an acre from beginning to end.

The *yield*, with a fair season and good care, is about 800 bushels an acre.

The *profit* about $100 to $250 an acre. As one large grower expressed it, "It takes nerve and money to grow onions."

For the maggot the best remedy is carbolic acid and lime. Slake the lime to a thin cream. Use 3 pints to 1 gallon of water; add 1 tablespoonful crude carbolic. Apply weekly with great thoroughness, so that surface of soil about plants is well coated.—*C. H. L.*

Orange Thrips. By D. Moulton (*U.S.A. Dep. Agr. Bur. of Entom. Tech. Bull.* 12, part 7; Feb. 1909; figs.).—This (*Euthrips citri*) is a new and troublesome pest of orange trees in California. Its attacks are characterized by curled and thickened leaves and marked fruits. The pest is less prevalent on loamy than on clayey soils. It is suggested that a strong tobacco wash should be used as a spray.

The insect is described.—*F. J. C.*

Orchid, Fertilization of a Green. By G. W. Bulman, M.A., B.Sc. (*Knowledge*, April 1910, pp. 129-130).—This article is based upon observations by Prof. Plateau, of the University of Ghent, whom the author supports in his view that the bright colours of flowers do not play the important *rôle* in attracting insects which is usually assigned to them. His observations extended to some seventy-nine species with green or greenish flowers, which he found able to attract all the attention from insects required for their pollination. The article is more particularly concerned with observations upon the methods of pollinating the Twayblade (*Listera ovata*), an indigenous orchid bearing green flowers.

Many observed details did not accord with those recorded by Darwin and others, the insects settling indifferently upon any part of the flower convenient, and commencing their consumption of nectar sometimes from the bottom of the furrow in the lower lip and sometimes from the top. Of 152 visitors not more than fifteen carried away pollen; one ichneumon fly visited twenty flowers without carrying away any. Insects with pollen sometimes succeeded in freeing themselves from their burden, and of those which safely collected and retained pollen much was wasted on flowers already past the right stage; but all this is compensated for by the multiplicity of visits, so that most of the flowers were successfully pollinated. One hundred and fifty-two visits observed included eighty-four Diptera, twenty-one ichneumon flies, forty-three other Hymenoptera, two Lepidoptera, and two beetles. Ichneumon flies, although constituting only about 14 per cent. of the visitors, led to about half the successful pollinations.—*W. A. V.*

Orchid Portraits.—The following new and rare orchids have been figured recently:—

Angraecum Kotschyi . .	*Gard. Chron.* 1909, ii. p. 221, fig. 94.
*Anguloa Cliftonii . . .	*Gard. Mag.* 1910, p. 83; *Journ. Hort.* 1910, i. p. 117.
Brassocattleya × Cliftonii magnifica	*Gard. Mag.* 1910, p. 31; *Orch. Rev.* 1910, p. 48, fig. 4.

B.-c. × Wellesleyae	*Gard. Mag.* 1910, p. 123.
Bulbophyllum Binnendijkii	*Gard. Chron.* 1910, i. p. 84, fig. 46.
B. saurocephalum	*Gard. Chron.* 1909, ii. p. 242, fig. 107.
Calanthe lilacina	*Gard. Chron.* 1910, i. p. 66, fig. 38.
*Cattleya × iridescens splendens	*Journ. Hort.* 1910, i. p. 27.
Cirrhopetalum campanulatum	*Bot. Mag.* t. 8281; *Orch. Rev.* 1910, p. 73, fig. 6.
C. Medusae	*Garden*, 1910, i. p. 52.
Cycnoches densiflorum	*Bot. Mag.* t. 8268.
C. maculatum	*Orch. Rev.* 1909, p. 273, fig. 21.
*Cypripedium × Boltonii	*Journ. Hort.* 1909, ii. p. 529; *Orch. Rev.* 1910, p. 41, fig. 3.
C. × Cymatodes 'Beechense'	*Journ. Hort.* 1910, i. 95.
*C. × 'Cynthia,' Westonbirt var.	*Gard. Mag.* 1909, p. 828.
C. × 'Lord Wolmer'	*Gard. Mag.* 1910, i. p. 107.
C. × 'Mme. Alfred Bleu'	*Journ. Hort.* 1909, ii. p. 611.
C. × 'Memnon'	*Journ. Hort.* 1910, i. p. 139.
*C. × 'Mrs. F. Sander'	*Gard. Chron.* 1910, i. p. 19, fig. 19.
C. × 'The Lion'	*Gard. Mag.* 1909, p. 979.
C. × 'Wellesleyae'	*Orch. Rev.* 1910, p. 81, fig. 7.
*Dendrobium taurinum Colmanii	*Gard. Mag.* 1909, p. 813.
*D. × 'Duchess of Albany'	*Gard. Chron.* 1910, i. p. 139, fig. 61.
*D. × 'Mrs. Fenton Arnton'	*Gard. Chron.* 1910, i. p. 149, fig. 64.
*Houlletia Sanderi	
Laeliocattleya × 'Nelthorpe Beauclerk'	*Garden*, 1909, ii. p. 616.
*L.-c. × 'Pizarro,' Westonbirt var.	*Garden*, 1909, ii. p. 563.
Odontioda × Bradshawiae, Cookson's var.	*Orch. Rev.* 1910, p. 59, fig. 5.
*Odontoglossum × Cravenianum	*Gard. Mag.* 1910, p. 211; *Orch. Rev.* 1910, p. 113, fig. 9.
*O. × 'Gladys'	*Gard. Mag.* 1910, p. 253.
*O. × splendens	*Gard. Mag.* 1910, p. 191.
*O. × Thompsonianum 'Gatton Park'	*Journ. Hort.* 1910, i. p. 277.
*Phaiocalanthe × Schröderiana	*Journ. Hort.* 1910, i. p. 233.

G. W.

* A painted portrait of those having an asterisk prefixed is preserved in the Royal Horticultural Society's collection.

Ourisia macrophylla. By N. E. Brown (*Bot. Mag.* tab. 8295). Nat. ord. *Scrophulariaceae*; tribe *Digitaleae*. New Zealand. Herb,

perennial. Leaves radical. Flowers in 1-4, 3-5-flowered whorls. Corolla 10-11 lines across, white.—*G. H.*

Paper Birch in the North-East. By S. T. Dana (*U.S.A. Dep. Agr. Forest Service, Circ.* 163, July 1909).—In addition to several important uses to which the timber of the paper birch (*Betula papyrifera*) —a tree which, by the way, does well in this country—is applied, it is largely used in the making of toothpicks and for shoe-pegs, no fewer than 3000 cords being annually consumed in the manufacture of the former alone.—*A. D. W.*

Peach, 'Theophile Sueur.' By Pierre Passy (*Rev. Hort.* Dec. 16, 1909, pp. 574-575; col. plate).—Raised from 'Grosse Mignonne Latue.' According to the plate, this is an extremely handsome fruit of a deep rich crimson colour, which tint surrounds the stone star fashion, as shown by section.—*C. T. D.*

Peach-tree Bark Beetle. By F. F. Wilson (*U.S.A. Dep. Agr., Bur. of Entom., Bull.* 69, part 9; Feb. 1909; figs.).—This beetle bores into the bark of peaches and often causes the death of the trees. The tunnels are not unlike those of *Scolytus rugulosus*, which also occurs in peaches and in other trees in Great Britain as well as in America. The life history of the pest (*Phlaeotribus liminaris*, Harris) is described and the various stages are figured. The methods recommended for dealing with it are applicable to several other boring beetles and are as follows:—

For Trees seriously Injured.—Severely trim back the trees and apply barn-yard manure or commercial fertilizers; then apply a thick coat of whitewash three times a season, the first application to be made the last week in March, the second during the second week in July, and the third about the 1st of October.

For Trees apparently Healthy but slightly Attacked.—Paint the trees with a thick coat of whitewash three times each season, as in the previous treatment, applying it to the trunks and larger limbs. The whitewash applied at the times specified will act as a repellent, the emergence of the beetles being slightly later than the dates given for the different applications. Add $\frac{1}{4}$ lb. table salt to each pail of whitewash, thus making the latter more adhesive. All the dead or nearly dead limbs and trees should be removed and burned as fast as they appear in an orchard, as this will destroy the breeding-places.

These suggestions are made as the result of experiments, and if they were followed for similar pests they would need to be modified to some extent, according to their life-histories.—*F. J. C.*

Peanuts. By W. R. Beattie (*U.S.A. Dep. Agr. Farmers' Bull.* 356, May 1909; illus.).—Peanuts constitute an important crop in the States, but should be still more grown in the waste lands of the Southern States, and so avoid the necessity for buying peanut oil abroad. The fodder is also good. The peanut requires a long season of

growth, and the same climate as tobacco and cotton, and an abundance of lime in the soil. Being leguminous, the nodules increase the store of nitrogen, provided the roots are left in the soil. The different varieties are " Virginia Bunch " and the climbing form (has large nuts), " Spanish " (smaller nuts, but richer in oil), " Tennessee Red " (rich in oil, but dark in colour), &c.

Peanut oil resembles olive oil and cotton-seed oil, coming between the two, and is frequently added to both in order to lower or raise their respective quality. The nuts (or peas) are largely used in making candies. Ground fine they constitute peanut butter. The damaged nuts and waste products make excellent feed for stock, but it is liable to become rancid very quickly.

Much of the commercial peanut oil is manufactured at Marseilles from nuts grown on the coast of Africa. These are very rich in oil—as high as 50 per cent. When cut and cured, peanut hay is almost equal in feeding value to the best clover hay.—*C. H. L.*

Pear-leaf Mite (*Phytoptus piri*). By L. Chasset (*La Pom. Franç.* October-November 1909, pp. 347-349).—This mite lives inside galls which open on the under side of the leaf. They are almost inaccessible to all insecticides; they hibernate in cracks in the bark of the tree. The winter treatment recommended is lime sulphur, composed of water, 12 litres; quicklime, 2 kilos; flowers of sulphur, 500 grams to 1 kilo. Boil for half an hour, let cool, and paint the tree with it. In spring, when the leaves begin to unfold and the insects have not yet entered the leaves, spray with one of the following mixtures: (1) 1 litre of the above-mentioned sulphur and lime wash strained through a cloth, adding 50 or 60 litres of water; (2) ordinary tobacco juice, 1 litre to 15 or 20 litres of water; or (3) concentrated tobacco juice 500 grammes, soft soap 1 kilo, water 100 litres. Bichloride of mercury sprayed in spring has also been found to lessen the number of *Phytoptus piri*.—*C. H. H.*

Pecans. By W. H. Hutt (*U.S.A. Exp. Stn. N. Carolina, Bull.* 30, No. 9; Sept. 1909; 25 figs.).—A preliminary report of observations and researches during the last three years on the subject of pecan culture in North Carolina. " The pecan tree is a native of the southern Mississippi valley; in geographical distribution it thrives wherever the cotton does, and in the matter of soils it is as cosmopolitan as the strawberry."

" Among the nuts that yield the greatest amount of nourishment pecans stand almost first, the edible portion of the nuts containing 12·1 protein, 11·12 carbohydrates, 70·7 fat, 1·6 mineral matter, and 3·4 water."—*V. G. J.*

Perception of Light in Plants. By Harold Wager (*Ann. Bot.* vol. xxiii. July 1909, pp. 459-488; 2 plates).—It is well known that the stimulus which causes the foliage leaves of many plants to place themselves in such a position as to receive the fullest advantage from

the incident rays of light is perceived mainly by the leaf-blade, and that this stimulus is transmitted to the petiole, by which the turning of the leaf is brought about. The recent researches of Haberlandt have awakened fresh interest in this question. That author endeavoured to explain by what means the leaf perceived the most advantageous position for the incident rays. He showed that in many plants the upper epidermal cells are shaped like convex lenses, and being filled with a clear sap are able to bring about a convergence of light rays; in others, special cells or local thickenings of the cuticle act in the same way. Haberlandt suggested that these cells are functional as ocelli, or primitive eyes, capable of setting up a stimulus which results in the heliotropic orientation of the leaf. The epidermal cells have a thin layer of protoplasm on their basal walls. When the leaf is at right angles to the light, the central portion of this layer in each cell is illuminated, the peripheral zone remaining dark. In oblique illumination the bright spot of light moves to one side; and this alteration in the position of the light spot, according to Haberlandt, sets up the stimulus which results in the orientation of the leaf into a more favourable position. The evidence for this conclusion is based upon the optical behaviour of the epidermal cells and upon experiments by which the lens function is eliminated.

In the present paper the author criticizes some of Haberlandt's conclusions and gives the results of his own researches on the subject. He notes first of all the efficiency of the lens cells in question by pointing out that in many leaves they are able to form clear images of objects focussed through them, which may be easily seen under the microscope and can be photographed. The following is a slightly abridged account of the author's own summary:

Haberlandt's hypothesis is open to criticism both on morphological and on physiological grounds. The phenomenon of convergence of light by the cells of plants is of very widespread occurrence. Not only the epidermal cells of leaves, but all cells which through turgidity assume a spherical or cylindrical form are capable of bringing it about. The cells of the lower as well as the upper epidermis are in most cases capable of light convergence. Special lens cells and lens-shaped thickening of the cuticle often occur on the lower epidermis. The position of the lens-shaped thickening of the cuticle in *Garrya elliptica*, which occurs on both sides of the leaf, has no relation to the position of the epidermal cells.

According to the form and outline of the cell the rays of light may be converged to a local point, a focal line, or to an irregular figure intermediate between these. Cells with very irregular outlines, such as *Eranthis hyemalis*, commonly have more than one series of converging rays, each producing a bright spot of light. Cylindrical cells which bring rays to a focal line are present on some orthotropic organs, such as stalks of leaves, pedicels of flowers, and hypocotyls of seedlings. Papillate cells and lens-shaped thickenings are found on leaves which are not heliotropically sensitive.

The extent to which the phenomenon of light convergence is simply a result of cell-turgor and not an adaptation to light perception cannot be definitely determined, but it is suggested that the curvature of the lens cells of the epidermis may be found to bear some relation to the thickness of the cell-wall and cuticle. It is possible that this turgidity may be the starting-point for an adaptation to (1) either light perception, or, as Haberlandt suggests, to (2) the more efficient illumination of the chlorophyll grains, or (3) both; but the evidence is not very conclusive.

The papillate epidermal cells of petals exhibit a very pronounced convergence of light, with a clear differentiation on the basal wall of a central bright area. It is only in very few leaves, where the cells are highly papillate or where there is a well-marked local thickening of the cuticle, that we get the differential illumination of the basal wall required by Haberlandt's hypothesis. In some it is not visible at all under any conditions, in others only when a small stop is used, and in a large number of leaves (probably the majority) there is no differential illumination as defined by Haberlandt.

The experiments which have been made upon the elimination of the lens function by submerging the leaves in water, or by covering them with a layer of paraffin oil, have given results which are so contradictory and unsatisfactory that a much more complete investigation is necessary. In a few special cases, the lens cells appear to bring about a concentration of the light on the chlorophyll grains. In some leaves the general arrangement of the lens cells with respect to the chlorophyll grains seems to indicate that they are effective in promoting a more efficient illumination of the chlorophyll grains. Haberlandt suggests that the stimulus may be brought about by the difference in pressure exerted by the light upon the cytoplasm; but this is so very slight that it is hardly probable it can be effective.

There seems to be no good reason why the epidermal cells should be the percipient cells more than the chlorophyll-containing cells, except that the presence of chlorophyll would interfere with the incidence of the light upon the percipient protoplasm. There is, however, some evidence that the perception of light is bound up with its absorption by the chlorophyll grains, in which case the palisade cells would be the percipient cells, and the chlorophyll grains with the cytoplasm in connexion with them the actual percipient organs. The evidence for this is as follows: The heliotropic response depends mainly upon the quality of the light and not upon its intensity; the rays which are active are those which are absorbed by the chlorophyll—of these the more refrangible rays are the most important; if it were merely the intensity and not the quality of the light there seems to be no reason why the red and yellow rays should not be just as active as the blue and violet rays; in the more refractive half of the spectrum the amount of light absorption is greatly in excess of that required for assimilation; when a chlorophyll screen is interposed between the leaves and the light the heliotropic response either ceases altogether or is much reduced; in motile organisms, such as *Euglena*, the heliotactic response is bound up with

the absorption of light by the pigment-spot; in the large majority of animal eyes the presence of a layer of pigment in connexion with the actual percipient organs seems to be necessary; light exerts a very definite stimulus upon the chlorophyll bodies of some Algae and foliage leaves, resulting in their movement into positions in which they can be more effectively illuminated (why should not a similar stimulus bring about the orientation of the leaf itself if the chlorophyll grains are capable of movement?); the rays absorbed by the chlorophyll, which are functional in heliotropism, are the chemically active rays; chemical changes taking place in the chlorophyll would afford a more satisfactory explanation of the origin of the stimulus than the pressure of light upon the cytoplasm.

With the exception possibly of the few special cases in which the light is concentrated upon the chlorophyll grains, there is no satisfactory evidence to show that the lens-shaped cells or local cuticular thickenings can be regarded as special adaptations, either for light perception or for the more efficient illumination of the chlorophyll grains, although it is possible they may be of use for both purposes.—*A. D. C.*

Peridermium Strobi, the Blister of Weymouth Pine. By Dr. W. Somerville (*Quart. Jour. of Forestry*, vol. iii. 3, p. 232).—The author considers that, owing to the prevalence of this disease, the Weymouth pine in this country is almost doomed. *Pinus Cembra* is rarely seriously affected, but other young five-leaved pines, particularly *P. Strobus* and *P. monticola*, are destroyed wholesale. *P. Lambertiana* and *P. excelsa* are also attacked. The spores of the form of the fungus which attacks the pine, known as *Peridermium Strobi*, are produced in enormous numbers and in great masses on the bark in April and May, and these spores attack species of Ribes, producing fructifications on the leaves of these plants in July. This form (the teleutospore stage) is known as *Cronartium ribicola*. The author considers that the only thing to do in this country is to stop the cultivation of five-leaved pines, and counsels the authorities of Canada and U.S.A. to prohibit the importation of five-leaved pines and species of Ribes, so as to prevent the spread of the disease to America, where it is at present unknown.—*F. J. C.*

Pharmaceutical Institute of the Berlin University. (*Not. König. Bot. Berlin*, No. 45, vol. v. pp. 115-121).—(A) Caoutchouc from East Africa. Samples of sap were examined: *Landolphia Kirkii* contained 78·14 per cent. pure caoutchouc, *L. florida* 15·33 per cent.; but better results would probably be obtained by improved methods of tapping and treatment. *L. parvifolia* contained 75·2 per cent. resin and 13·6 per cent. caoutchouc, and is of little commercial value.

(B) Sap of *Euphorbia Tirucalli* contains little rubber, but may prove a useful substitute for mastic.

(C) Oil from the seed of *Mimusops javensis* (?). This fat melts at 40° C., and yields, on saponification, 96·66 per cent. fatty acids and

8·08 per cent. glycerine. It has a considerable commercial value, and may be used for cooking.

(D) Resin from "Bror" from the Pelew Island "Korror." The resin from the tree called Bror is well adapted for the preparation of varnish or furniture polish.

Listrostachys Behnickiana is an improved *L. pellucida*, with large flowers, pure white inside.—*S. E. W.*

Phosphatic Manures. By C. G. Hopkins (*U.S.A. Exp. Stn. Illinois, Circ.* 127; Jan. 1909).—The author shows that finely ground rock phosphate ("floats") has in Illinois and other States given results as good as (and when cost is taken into consideration, better than) those obtained through the use of acid phosphate (superphosphate) when the manure has been used with a sufficient amount of organic matter in the soil and the results computed over a series of years. In the case of the return from a crop in the first year only, the superphosphate gave the better results.

A warning is uttered regarding the continued export of phosphatic rock, which is now proceeding at the rate of over a million tons per annum, worth at the mine about £1,250,000. The future of American agriculture depends largely on the supply of phosphatic manures, and the danger of trusts and unlimited export is emphasized.—*F. J. C.*

Pineapple Growing in Porto Rico. By H. C. Henricksen and M. J. Jones (*U.S.A. Exp. Stn. Porto Rico, Bull.* 8, April 1909; plates).—The pineapple has certain well-defined likes and dislikes, and every part of the island of Porto Rico does not possess a soil which is equally suited to its cultivation. The plant will sometimes thrive, however, in theoretically unsuitable localities, so that no one should hesitate to attempt its growth in any part of the island so long as he is willing to pay proper attention to its after-management. It is important to avoid importing infected stock, as has been done so often in the past, to the danger of the whole industry in Porto Rico, and the planter should also always be prepared to fight the various diseases and pests to which the plants are liable.

This bulletin gives an illustrated account of the pineapple, describes its varieties and methods of cultivation, and gives advice on the treatment of diseases, on fertilization, and on the industry from the commercial point of view.—*M. L. H.*

Pine, New Disease. By E. Münch and C. v. Tubeuf (*Nat. Zeit. Land-Forst.* viii. pp. 39-44; Jan. 1910).—Year-old needles of Scots Pine were found to be partially brown. This was traced to the action of a parasitic fungus, hitherto unrecorded; it is named *Hendersonia acicola* and belongs to the *Sphaeropsideae*, a group of the 'Fungi Imperfecti.'—*W. G. S.*

Pomological Statistics (*La Pom. Franç.*, January 1910).—Printed form to collect information as to varieties of fruit: (1) Most

cultivated in plains and valleys of the region. (2) Most cultivated in mountainous parts. (3) Varieties little cultivated, but deserving to be better known. (4) Varieties of most commercial importance in the district. (5) Varieties most generally exported abroad. (6) Varieties that resist best diseases, hard winters, and spring frosts in the district. (7) Varieties which in the district are remarkable for their vigour and hardness. (8) Varieties recognized in the district as being the most fertile. (9) Observations.—*C. H. H.*

Populus nigra var. **betutifolia.** By S. A. Skan (*Bot. Mag.* tab. 8298).—Nat. ord. *Salicaceae*. Origin uncertain. Tree 30-85 ft. high. Leaves deltoid-rhomboid, 2½-4 in. long. Male catkins 1-2 in. long. Anthers red.—*G. H.*

Potato Scab and Mercuric Chloride. By J. G. Gregory (*Jour. Dep. Agr. Vict.*, October 1909, p. 671).—Owing to seed potatos being expensive, scabby seed potatos were soaked for 1½ hours in a 1-in-1000 solution of corrosive sublimate (mercuric chloride); the resulting crop was perfectly clean. Land infected with scab germs will still be infectious after keeping potatos out of the ground for three years. By ploughing in heavy crops of green stuff and making the land slightly acid, the scab germs are apparently killed. The writer having followed this American advice, ploughed in two heavy crops of greenstuff and allowed time for the last to thoroughly rot, and grew really clean potatos.

C. H. H.

Potato-spraying Experiments in 1908. By F. Stewart, Y. French, and F. Sirrine (*U.S.A. Exp. Stn. New York, Bull.* 311).—The results of the seventh year's work in a ten-year series of potato-spraying experiments begun in 1902 are given. The experiments described are of three kinds: (1) Official ones at the Geneva Experiment Station; (2) farmers' business experiments; (3) volunteer experiments. The results are given in tabulated form and concern merely the spraying with Bordeaux mixture as a protection against blight and rot, but in all the experiments all the rows, including the unsprayed "check" rows, were dressed also with Paris green to control insects. The figures given are compiled to show what was the relative yield of the sprayed and unsprayed rows and what was the economic result—setting the cost of the processes against the increased profit. The results show that spraying is certainly an advantage to the crop, especially in dry seasons, and out of fourteen business experiments nine showed a financial profit and five a loss from the practice.

M. L. H.

Potatos, Rye, and Clover, Further Results in a Rotation of. By H. J. Wheeler and G. E. Adams (*U.S.A. Exp. Stn. Rhode I., Bull.* 135; May 1909).—This bulletin gives a continuation of the description of the three-year rotation, an acount of which, during two courses, is to be found in Bulletin No. 74.—*V. G. J.*

Potatos, Seed, Destruction of Blight Fungus by Heat. By D. McAlpine (*Jour. Dep. Agr. Vict.*, November 1909, p. 700).—"If the seed tubers are suspected, or in order to make certain that the fungus is destroyed, they may be sterilized. The ordinary sterilizing of the surface will not serve the purpose, for the fungus is inside the potato; but Jensen has devised an effective method of treatment. This consists in subjecting the seed potatos to a dry heat at a temperature of 120° F., not allowing it to fall below 118° nor to rise above 132°. I had some diseased potatos kept at a temperature of 110° F. for four hours, but afterwards they produced a luxuriant crop of the fungus in twenty-four hours, while at 120° the spawn of the fungus was destroyed. I have had an apparatus constructed consisting of a copper cylinder, with a movable basket inside capable of containing a bushel of potatos, and surrounded by a jacket of water kept, when necessary, at the proper temperature. After this treatment the germinating power of the tubers is rather improved than otherwise."—*C. H. H.*

Potatos, Seed, Disinfected by Formalin (*Jour. Dep. Agr. Vict.*, November 1909, p. 700).—Seed potatos may be simply disinfected by placing them in a loose bag and then steeping them in a solution of formalin for two hours. A 1-lb. bottle of the proper strength, costing 1*s.* 6*d.*, is added to 32 gallons of water, and, after stirring, it is ready for use.—*C. H. H.*

Potatos, Sprain in (*Jour. Bd. Agr.*, xvi. 1, p. 33; 8, p. 647).—When the potato is cut through the middle, brown spots, like the currants in a scone, show the presence of the disease. On cooking, the spots can be picked out like pellets.

The cropping of the potatos is not affected, and the ailment is found in well-proportioned tubers. Some observers have found the haulm of the potato darkened and covered with a white scale when the tubers are beginning to be attacked. The ailment develops in the pit, and is often scarcely noticed in a crop before storing. Dry, hot seasons, gravelly and sandy soil appear to favour the disease.

The experiments carried out at Kew, and the material submitted for examination, make it impossible to formulate a diagnosis of the disease. The most constant symptom is the presence of small, rust-coloured spots scattered in greater or less abundance throughout the flesh.

Where mycelium is present in the tissue of the brown spots "winter rot" caused by *Nectria solani* (Reinke) always develops. It is not at all probable that two distinct diseases presenting similar symptoms—rust-coloured spots—are present in potato tubers, and it would therefore appear that the disease is an incipient stage of "winter rot," which, for some reason, has been arrested in its preliminary stage. There is said to be the constant presence of an obscure organism accompanying "internal disease" in potatos, but for further information developments must be awaited.—*J. S.*

Potatos, The Greening of. By George Massee (*Jour. Bd. Agr.* xvi. 3, p. 177; 1 plate).—Experiments have been conducted at Kew for the purpose of ascertaining in what particular manner "greening" proves beneficial in potatos intended for seed.

The experiments show (1) that a potato not "greened" loses just over six times as much in weight during the season as a potato of equal weight that has been "greened"; (2) that a potato "greened" in spring loses twice as much in weight as a potato "greened" immediately after lifting in autumn, other things being equal; (3) "greening" in autumn will check the ravages of winter rot.—*J. S.*

Primula obconica, New Forms (*Die Gart.*; January 15, 1910, p. 34, with coloured plate).—Large flowering forms with pure white, crimson, red, and lilac flowers are figured, from Mr. George Arends, of Ronsdorf, Germany.—*G. R.*

Properties and Uses of the Southern Pines. By H. S. Betts (*U.S.A. Dep. Agr., Forest Service, Circ.* 164, Aug. 1909).—The three principal pines of the Southern United States are *Pinus palustris*, *P. echinata*, and *P. Taeda*. The enemies, mechanical properties, and utilization of these pines are here fully dealt with.—*A. D. W.*

Raspberry Beetle (*Byturus unicolor*). By W. H. Goodwin (*U.S.A. Exp. Stn. New York, Bull.* 202; February 1909; 3 plates).—The author gives a minute description of this destructive pest, which is closely allied to the European species *B. tomentosus*, and recommends spraying with 4 lb. arsenate of lead to 50 gallons of water, just before the beetles emerge from the soil. In connection with this he suggests that thorough cultivation late in the fall, close up around the canes, will destroy large numbers of pupæ.

The result of experiments shows that the yield of berries in 1908 on sprayed plots was 50 bushels, against 22 bushels in 1907 on the same plots unsprayed. The illustrations on pp. 180-185 give a good idea of the damage done by the beetles to buds, berries, and young leaves.

V. G. J.

Red Spider, The Common (*Tetranychus bimaculatus* Harvey) By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 104; January 1909; 4 figs.).—A detailed description is given of the life history, food plants, and distribution of the red spider, which is, properly speaking, not a spider, but a spinning mite.

The author then proceeds to discuss the relative merits of kerosene soap emulsion, lye-sulphur, sulphur water, and lime-sulphur for the destruction of the pest, and summarizes the remedies as follows:—

For the greenhouse and general use, sulphur and neutral (Castile) soap, whale oil, and other soap solutions, kerosene soap emulsion, and spraying with water. For the treatment of trees and shrubs, the same as the above, with the addition of resin wash and the lime-sulphur and lye-sulphur mixtures.

For truck and garden plants, lye-sulphur wash and the same remedies as for the greenhouse, with the addition of clean gardening or farming, early fall ploughing, keeping down weeds, and crop rotation where practicable.—*V. G. J.*

Respiration of the Organs of Vascular Plants. By G. Nicolas (*Ann. Sc. Nat.* vol. x. Nos. 1-3, pp. 113).—In normal respiration (N) the leaves of a plant have greater respiratory intensity and a lower respiratory quotient than the petiole, stem, and root. Respiratory intensity is defined as the oxygen absorbed by 1 gram of material an hour. The respiratory quotient, $\frac{CO_2}{O}$, is obtained by dividing the carbonic acid liberated per gram per hour by the oxygen absorbed per gram per hour. The intramolecular respiration (I) was determined by observing the gaseous changes which ensue when different parts of a plant are placed in an atmosphere which does not contain any oxygen. Under these conditions the leaves do not liberate more carbonic acid than other parts of the plant. As a rule the leaves give off less carbonic acid than in ordinary air. $\frac{I}{N}$ generally approximates $\frac{1}{2}$. A coating of vaseline on the lower surface of the leaves diminishes the normal respiration to $\frac{1}{3}$ to $\frac{1}{11}$, but the transpiration is reduced from $\frac{1}{10}$ to $\frac{7}{10}$ of its normal value. Hence the author concludes that respiration takes place through the cuticle and transpiration through the stomata. Green leaves are slightly more active than etiolated leaves.—*S. E. W.*

Rhizoctonia violacea causing a New Disease of Trees. By Dr. W. Somerville (*Quart. Jour. of Forestry*, vol. iii. 2, p. 134).—Reports the occurrence of *Rhizoctonia violacea* (the "copper web" fungus) on the roots and lower part of the stems of oaks and Scots pine, which were killed by it. The fungus has hitherto been known to attack lucerne, clover, potatos, carrots, mangolds, and crocuses, and causes considerable damage to them; but until now it has not been recorded on trees.—*F. J. C.*

Rhodazalea, New. (*Jour. Soc. Nat. Hort. Fr.* Aug. 1909, p. 487).—Messrs. Croux, who produced the hybrid known as *Rhodazalea Crouxii*, are now showing a double variety of 'Rhodazalea,' produced by crossing *Azalea mollis* with *Rhododendron* 'Marie van Houtte.' Among their collection of Rhododendrons are several good new varieties—'Mme. Emile Fessard,' 'Mme. Yvonne Delchelpe,' 'M. Emile Salacroup,' etc.—*M. L. H.*

Rhododendron Keiskei. By W. B. Hemsley (*Bot. Mag.* tab. 8300).—Nat. ord *Ericaceae*; tribe *Rhodoreae*. Japan. Shrub 3-7 ft. high. Leaves biennial, coriaceous, $1\frac{1}{4}$-3 in. long. Flowers yellow, $1\frac{3}{4}$-2 in. across.—*G. H.*

Rhododendrons, Chinese-Thibetan. (From the Bull. Soc. Nat. d'Acclimat. Fr.) (*Jour. Soc. Nat. Hort. Fr.* Nov. 1909, p. 696).—

M. de Vilmorin has succeeded in flowering for the first time in Europe some rare and valuable rhododendrons from the mountains of Su-Tchuen, in the north-west of Ichang, and a short description of them is here given.—*M. L. H.*

Rhodora canadensis (Rhododendron). By R. Rothe (*Die Gart.*; February 19, 1910, p. 86).—A pretty shrub, with deciduous oblong leaves, whitish beneath. The flowers are small, and produced in umbellate clusters. The author describes the remarkable and pretty effects these flowering shrubs make; ordinarily they grow in the regions of Northern Canada in low boggy places in great numbers, surrounded by the graceful but monotonous white barked birch, and higher up the sombre pine and fir tree. It is one of the first of spring flowers when the snow has not quite disappeared, and it is a most delightful sight to see the groups of *Rhodora* still without foliage in these surroundings. In England during a mild winter *Rhodora* flowers in February and March, otherwise not till April.

G. R.

Rodgersia pinnata. By W. Irving (*Garden*, Oct. 30, 1909, p. 531 and fig.).—This is the most handsome of the Rodgersias, growing about 5 feet high; it is later in starting than *R. podophylla*, but lasts longer in perfection, and the leaves are not so liable to sunburn. The Rodgersias are excellent for the moist and shady parts of the rock-garden; seedlings are freely produced, but slow in developing. T. Smith (*Garden*, Nov. 13, 1909, p. 551) considers *R. podophylla* still without a peer in respect of leaf-colouring. The leaves develop a purple-crimson colour in July, and in autumn exhibit the brightest leaf-colouring to be found among herbaceous plants.—*H. R. D.*

Roots, Anatomy of. By Hermann von Alten (*Bot. Zeit.* lxvii. 1 Abt. Heft x./xi. Oct. 1909, pp. 175-199, with 2 plates and 8 figs.).—The author criticizes Tschirch's researches on root-structure, and lays stress on the difference in that of young roots as compared with older ones. He distinguishes annexation (*Bereicherungs*) and nourishment (*Ernährungs*) roots. There are also remarks on the number of xylem groups in one and the same root-system and on the hypodermis, and on exogenous cork-building in roots.—*G. F. S.-E.*

Rosa Seraphini. By J. F. (*Garden*, Dec. 11, 1909, p. 599).—This rose was introduced in 1900. Its peculiar beauty for the rock-garden is rightly insisted on. It is a mountain-rose from Corsica, Sardinia, and Sicily, and found above 1,600 feet high in the Apuan Alps. Two varieties of it are found in the Maritime Alps. It flowers profusely while only 12 to 15 inches high, and the thorny stems are furnished with numerous short shoots, each terminating in a bright rose flower 1¼ inches in diameter. A little bush thus gets quickly covered with brightly coloured miniature flowers that associate well with the numerous occupants of the rockery. The leaves are 1½ to

2 inches long, made up of seven leaflets. From a spectacular point of view it is far more effective than hundreds of subjects considered appropriate for this form of gardening.—*H. R. D.*

Rose Chafer (*Macrodactylus subspinosus* Fab.). By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 11, revised July 1909; 1 fig.).—This circular deals with the immense damage done to crops in various parts of the United States by the rose chafer, which, according to Harris, confined its ravages to the blossoms of the rose when first noticed. In later years it has extended its range of food plants until now it is nearly omnivorous.

The grape vine and rose especially suffer from its depredations, but it is almost equally destructive to fruit, shade, and forest trees. The beetles consume blossoms, leaves, and fruit, and it is no uncommon sight to see every young apple on a tree completely covered with a sprawling, struggling mass of beetles.

Almost every method employed against other insects has been tried without avail, and compounds of copper, lime, and kerosene have failed to kill the rose chafer, and a thoroughly successful remedy has yet to be discovered for the extermination of the pest.—*V. G. J.*

Rose Slugs. By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 105; October 1908; 5 figs.).—The circular deals with the life history, distribution, and extermination of the three species of saw flies, the larvæ of which do considerable damage to the foliage of roses in the gardens of the United States.

Figures 1 and 2 represent the American rose slug (*Endelomyia rosae*). The larvae feed chiefly at night, and always on the upper surface of the leaves. When full grown they descend into the earth and construct a cell or cocoon, where they remain till the following spring.

Figures 3 and 4 show the second species, the bristly rose-slug (*Cladius pectinicornis* Fourer), which is of European origin and is pretty generally distributed in many parts of the United States, England, and Scotland. The larva in its earliest stage skeletonizes the leaves, but with increased growth it eats large, irregular holes, frequently leaving nothing but the stronger ribs. It forms a cocoon upon the plants on the surface of the ground.

Figure 5 shows the coiled rose slug (*Emphytus cinctus* L.), also a European introduction. The larva differs from the other two in devouring the entire substance of the leaf. Upon reaching maturity it bores into the pith of the stems of dead rose bushes or other available plants, where the pupal stage is passed.—*V. G. J.*

Roses, Notes on the Newer. By H. E. Molyneux (*Garden*, Sept. 11, 1909, p. 444 *et seq.*).—The writer includes in his subject roses introduced from 1906 to 1909. Good roses, with few exceptions, get into general cultivation in about three years. Sept. 18, p. 458, the H.P.s are dealt with; six are considered, and three—' W. H.

Walsh,' 'Mrs. A. M. Kirker,' and 'Urania'—are recommended as worth a trial. The H.T.s are considered in nine numbers (Sept. 25, p. 469, to Dec. 4, p. 589), no fewer than seventy-seven varieties being described and criticized. On Dec. 11, p. 602, the Teas are dealt with. This class is gradually improving in constitution, but a severe winter will generally play more or less havoc with them. Good Teas are still scarce, and the writer only includes fifteen varieties, of which 'Molly Sharman Crawford' and 'W. R. Smith' are specially commended. On Dec. 25, p. 629, the Wichuraianas are dealt with, six varieties being selected.—*H. R. D.*

Rudbeckia, a New Annual Variety. (*Jour. Soc. Nat. Hort. Fr.* Sept. 1909, p. 517).—Messrs. Vilmorin-Andrieux have produced a practically annual variety of *Rudbeckia hirta*, which bears immense single yellow flowers possessing the useful peculiarity of remaining fresh for several weeks, even under a hot sun.—*M. L. H.*

Sapium, Mexican and Central American Species of. By H. Pittier (*Contr. fr. U.S.A. Herb.* xii. (1909); pt. 4; plates).—Nine species, six of them new, of this genus of rubber-producing plants are described and figured. The value of the present species as rubber-producing plants has not yet been sufficiently tested.—*F. J. C.*

Saprophytes, Javanese. Thismia javanica. By A. Ernst, C. Bernard and J. J. Smith (*Ann. Jard. Bot. Buit.* viii. series ii. pp. 20-62; 9 plates).—*Thismia javanica* is a small saprophyte, found near Buitenzorg growing in a mass of humus at the foot of a tree, *Lansium domesticum*. Only the flower-buds appear above the surface of the soil. The plant has numerous white roots, emitting adventitious buds. The peduncle bears one or two flowers, having three triangular sepals of a pale orange colour and three denticulate petals terminating in long threadlike subulate appendices, also orange-coloured. The leaves are very rudimentary.—*S. E. W.*

Sarracenia and Cephalotus (*Beih. Bot. Centralbl.* xxv. 2. Abt. Heft 3, pp. 490-539; December 1909; with 58 text figs.).—Dr. Josef Schweiger (München) compares the microscopic structure of the roots, leaves, pitchers, pollen, and ovule in these genera. The details of stomata, hairs, and glands, &c., are very thoroughly compared, and for the most part figured. The development of the ovule in each is also contrasted. He finds that the differences are far more numerous than the resemblances, and especially that the development of ovules and seeds are very dissimilar. He concludes that there is no systematic relationship between the two forms, in spite of the apparent similarity of their pitchers.—*G. F. S.-E.*

Sawfly, The Yellow-Horned or Plum Fruit. By Dr. R. Stewart MacDougall (*Jour. Bd. Agr.*, xvi. 5, p. 385; 1 plate).

Description.—*Imago.*—The adult sawfly measures about $\frac{1}{5}$ inch in length and $\frac{1}{3}$ inch in spread of wings. Colour, black. Antennae.

bright yellow, or yellow-red, often brown at the tip. Wings are clear like water.

Egg.—Greenish white and translucent.

Larva.—A twenty-legged caterpillar, the abdominal prolegs being somewhat paler than the six thoracic legs; the body is wrinkled and whitish yellow, with a faint brown shade in older larvæ; the head is brown; the jaws are red-brown; the eyes are black; the body narrows at the hind end. The larvæ have an unpleasant odour.

Cocoon.—The cocoon, under cover of which pupation takes place, is cylindrical, brown, and covered with particles of soil.

The life-history of the sawfly is given in this article, and it would appear that the egg is laid in the flower-bud in the spring, the larva subsequently eating its way to the kernel of the stone. The cocoon is made in soil in June and July, and in this cover the winter is passed.

Fruits readily fall from the tree when infested, and they should be collected and destroyed at once before the larvæ leave them.

The soil below infested trees should be worked and the turned-up layers beaten.—*J. S.*

Saxifraga madida. By J. F. (*Garden*, Nov. 6, 1909, p. 538).—This is a new Saxifrage intermediate between *S. Fortunei* and *S. cortusaefolia.* It is autumn flowering, white, and forms a large pyramidal panicle. It is the first of the three to flower, *S. cortusaefolia* not being many days behind, and *S. Fortunei* ten or twelve days later.—*H. R. D.*

Seedlings, Transpiration of (*Bot. Gaz.* vol. xlviii. pp. 275-282, October 1909; with 5 figs.).—Seedlings of various plants were grown in a saturated atmosphere in a greenhouse (rel. humidity 60 per cent.), and in room (rel. humidity 16 to 32 per cent.), and the differences in transpiration recorded. The ratio of the transpiration of moist-air leaves to that of dry-air leaves of the same species varied from 2·2 to 10. Much individual variation was found.

The plants from moist air were taller, more slender, longer-leaved, less hairy, with thinner, lighter-coloured, and more translucent leaves.

The leaf thickness was 25 to 40 per cent. greater in the dry-air plants. In very moist air the leaves of *Sinapis* and *Cucumis* are less indented on the margin. The stomata of moist-air plants could not close so efficiently or quickly as those of the dry-air plants. Young plants of *Ipomoea* were, however, soon able to adapt themselves to dry-air conditions.—*G. F. S.-E.*

Siparuna thea. By E. Gilg and H. Strauss (*Not. König. Bot. Berlin*, 45, vol. v. Nov. 7, 1909, pp. 113-114).—The plant described by Seeman (*Journ. of Bot.* II. (1864), p. 343) as *Citriosma thea*, and afterwards named *Siparuna thea* by De Candolle, flowered for the first time in 1909 when planted in the border of the Colonial House of the Botanical Garden in Dahlem. It had previously been grown in tubs. The characteristic flowers and leaves show that it does not

belong to the order of *Monimiaceae*. The authors describe it as *Campomanesia thea*.—*S. E. W.*

Sodium as a Partial Substitute for Potassium. By B. L. Hartwell and F. R. Pember (*U.S.A. Exp. Stn. Rhode I., 21st Ann. Rept. part* 2 (1908); pp. 243-285; plates).—Experiments on the replacement of potassium by sodium in continuation of those already reported (see JOURNAL R.H.S. xxxiv. p. 594) are discussed. It is concluded that sodium is able to replace potassium in certain of its functions but not in all, and that in the principal functions of potassium, sodium cannot replace it. Thus, unless a sufficient amount of potassium is present to enable these functions to be performed maximum growth cannot be secured. Less potassium, however, is absorbed when that element is supplemented by sodium than when it is not, so that sodium acts as a conserver of potassium.—*F. J. C.*

Soil Fertility. By Thomas F. Hunt (*U.S.A. Exp. Stn. Pensylvania, Bull.* 90; March 1909; 13 tab., 7 charts).—A series of experiments with fertilizers has been conducted for twenty-five years on a clay loam soil of limestone origin. The series consists of four tiers of 36 plats each in a rotation consisting of corn, oats, wheat, and hay (mixed timothy and clover). Fertilizers were employed in alternate years, viz. to the corn and wheat.

Of the three essential fertilizing ingredients, nitrogen, potash, and phosphoric acid, only the latter produced any increase of yield when used alone. A much larger increase was obtained by using both potash and phosphoric acid. There is no evidence thus far to show that the supply of nitrogen cannot be definitely maintained on this limestone soil by means of a rotation containing clover, provided the mineral fertilizers are abundantly supplied.

The addition, however, of 24 lb. of nitrogen an acre to the mineral fertilizers has resulted in a material increase in yield; greater quantities of nitrogen produced very little effect. Nitrate of soda has proved a better form of nitrogen than dried blood or sulphate of ammonia; the continuous application of the latter caused acidity in the soil. It has been possible during twenty-five years to maintain the crop-producing power of the soil without the use of any yard manure.—*V. G. J.*

Soil Nitrogen. By Henry G. Knight and Frank A. Smith (*U.S.A. Exp. Stn. Wyoming, Bull.* 82; June 1909; 4 figs., 1 plate).—The bulletin deals with the chemical and mechanical conditions that go to make a fertile soil, and describes the several classes of nitrifying bacteria which work upon the organic nitrogen present in the soil. Results are given of experiments in fertilizing with legumes and nitrate of soda.—*V. G. J.*

Soils, Absorption by. By H. E. Patten and W. H. Waggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 52, Aug. 1908).—This bulletin

gives, first, a summary of the results obtained by other scientific investigators into this subject, and concludes with an account of the experiments carried on in the laboratory of the Department of Agriculture at Washington.

The subject is important in view of practical soil work, the manufacture of fertilizers, and for various technical processes. The principal object of the work has been to determine how absorption controls the concentration of the soil solution, which is the great nutrient medium upon which plants feed, and, further, to determine its effect upon the structure of the solid portion of the soil in modifying its power to hold and maintain the soil solution for the continued use of the plant. It has been shown that a number of modifying factors enter into each particular case, which make it impracticable to formulate a simple general law which will account quantitatively for the distribution of a dissolved substance between the liquid solution and the absorbing medium. The nature of these modifying factors has been the subject of careful investigation, the results of which are here recorded. The most important of these factors is the change in the physical character of the soil itself consequent upon the absorption of the dissolved materials, which change, in turn, influences the drainage condition, the aeration of the soil, its capacity to hold the soil solution and control its movement through the soil, the composition of the soil solution, and the character and rate of the chemical changes taking place in the soil solution.

In order to bring out clearly the general application of the phenomena of absorption and the general principles derived therefrom, a number of *solvents* (or pure liquids used to dissolve some solid, liquid, or gas), of *solutes* (or the substances dissolved by the solvent), and of absorbents, in addition to soils and constituents of the soil solution, have been studied.

The establishment of these general phenomena, in the case of pure substances where no life processes enter, strengthens very greatly the certainty in their validity when they are found to hold good for such very complex materials as exist in soils and soil solutions.

The bulletin gives tables of statistical results of successive soil analyses and descriptions of the apparatus and methods employed by different investigators.—*M. L. H.*

Soy Beans. By C. V. Piper and H. T. Nielsen (*U.S.A. Dep. Agr., Farm. Bull.* 372; October 1909; 6 figs.).—The bulletin, after describing the plant and its culture, deals with the importance of the soy bean as a forage crop and the food value of the meal for dairy cows. "In the trial for the comparison of soy-bean meal and cotton-seed meal the yield both of milk and butter fat was about 5 per cent. greater for soy-bean meal."—*V. G. J.*

Soy Bean (a Comparison with the Cow Pea). By Chas. A. Mooers (*U.S.A. Exp. Stn. Tennessee, Bull.* 82, Dec. 1908).—The

soy bean and the cow pea resemble each other very closely, but the former has some marked advantages over the latter:—

1. It has an upright growth (not clinging).
2. More reliable as to fruitfulness under varying conditions.
3. Not harmed by slight frosts.
4. Rich in protein and oil; may even be substituted for cotton-seed meal.
5. Seed not attacked by weevils.
6. Beans ripen together, and may be cut and threshed (cow peas ripen irregularly and must be hand-picked).

On the other hand (1) cow peas germinate more certainly, producing a better stand. They are not liable to heat and spoil in storing, like soy beans, and are not so much appreciated by rabbits; (2) when grown with sorghum and allowed to climb, they outyield soy beans in vine and fruit; (3) are much more easily cured by ordinary methods; (4) and will sometimes yield a second crop.—*C. H. L.*

Strawberries for Dry Weather. (*Jour. Soc. Nat. Hort. Fr.* Sept. 1909, p. 516).—The varieties of strawberry known in France as 'Saint-Joseph,' 'Jeanne d'Arc,' 'Constante Féconde,' 'Cyrano de Bergerac,' 'Souvenir Normand,' though producing small-sized fruit, are said to bear drought better than any other kinds.—*M. L. H.*

Sugar Beet, Leaf-hoppers of. By E. D. Ball (*U.S.A. Dep. Agr., Bur. of Entom., Bull.* 66, part 4; Jan. 1909; plates).—Among the diseases of sugar beet is one called "curly leaf," but more than one form of the disease has been confused under the one name. The one with which this bulletin deals is characterized by the leaves becoming rough and warty and curling up, and by the beet becoming stunted. The plant does not recover in this case. The other form is characterized by the presence of numerous pale spots, and the edges turn down, but otherwise the leaf is smooth, and the injury is confined to the leaf attacked. The latter form is due to the attack of a species of *Empoasca*, the former to the attack of the beet leaf-hopper, *Eutettix tenella*. The insect, which is a native of the south-western States, belongs to the Hemiptera. It is a small, pale yellowish green species, very active in all stages. The nymphs are pale creamy white or coloured brown, &c., and the eggs, which are laid in the petiole, are white. It feeds on a variety of native plants allied to the beet. It is suggested that spraying with paraffin emulsion as soon as the hoppers appear, with an attachment to the sprayer to turn the leaves over, or the use of a tarred board with an agitator to cause the insects to fly, would be the best means of destroying the pests. Rolling the ground while damp and in cool weather would also materially lessen the pests.

Several other species of *Eutettix* and of *Agallia* feed on plants allied to the beet, and may possibly become troublesome pests of that plant.

F. J. C.

Sugar-beet Varieties, Comparative Tests of. By J. E. W. Tracy and J. F. Reed (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 37, Sept. 1909).—The tabulated results of tests which have been conducted at different stations in order to determine the ability of various strains and varieties of sugar beet to produce a paying crop under varying local conditions. The testing at each station was done under similar conditions and in the same manner, and all plots were planted as a farm crop, no care being taken to produce extra yield or high sugar content that could not be secured in a general crop.—*M. L. H.*

Syringa Bretschneideri. By N. E. Brown (*Bot. Mag.* tab. 8292). Nat. ord. *Oleaceae*; tribe *Syringeae*. North China. Shrub 10 ft. or more in height. Leaves elliptic. Panicle 3-12 in. long, 3-6 in. wide, densely clustered at the nodes or at the tips of terminal branchlets. Corolla lilac-rose.—*G. H.*

Tamarisks for Inland Planting. By E. Curgwen (*Garden*, Nov. 20, 1909, p. 564).—There are no grounds for the popular notion that this shrub can only be grown near the sea. The writer describes the ornamental character of the plant, with its feathery masses of apricot-coloured flowers. Several hardy varieties are mentioned. *T. gallica*, flowering from May to October, and the similar but finer *T. tetranda* are specially commended.—*H. R. D.*

Teratology, Tropical. By J. C. Costerus and J. J. Smith (*Ann. Jard. Bot. Buit.*, viii. series ii. pp. 1-17; 8 plates).—Deviations from normal growth in plants grown in the Buitenzorg Botanical Gardens are illustrated by sketches by Javanese draughtsmen. They include *Caladium* with split petiole, *Colocasia affinis*, *Alocasia macrorrhiza*, *Carludovica palmata*, *Dendrobium mutabile*, *D. Rumphianum*, *Rhyncostylis retusa*, *Paphiopedilum praestans*, *P. glaucophyllum*, *P. Chamberlainianum*, *Bulbophyllum obscurum*, *Coelogyne pandurata*, *Gloriosa Plantii*, *Musa sapientium*, *Telanthera philoxeroides*, *Hevea brasiliensis*, *Acalypha hispida*, *Begonia Rex*, *Caesalpina pulcherrima*, and *Calendula officinalis*.—*S. E. W.*

Thompsonella platyphylla, Rose. By N. L. Britton and J. N. Rose (*Contr. fr. U.S.A. Nat. Herb.* xii (1909); pt. 9; pp. 391-392; plates).—A new genus of Crassulaceae is founded, named *Thompsonella*, to include the plant hitherto known as *Echeveria minutiflora*, now *T. minutiflora*, and the new *T. platyphylla*, with glaucous, fleshy leaves, 4 in. to 5 in. long and an inflorescence 8 in. to 9 in. in height. Native in Mexico.—*F. J. C.*

Thrips, Coal-tar Water for. By C. French, jun. (*Jour. Dep. Agr. Vict.*, November 1909, p. 771).—Boil 1 lb. coal tar in 2 gallons of water, and while hot add from 50 to 100 gallons of water. This spray acts as a deterrent to thrips. It may be also used on cabbage, cauliflower, turnip, and radish plants.—*C. H. H.*

Timber of Togoland. By G. Volkens (*Not. König. Bot. Berlin*, Appendix xxii. No. 2, Nov. 7, 1909, pp. 33-42; 4 figs.).—The trees in Togoland of commercial value are given in order of merit: *Chlorophora excelsa*, *Pterocarpus erinaceus*, *Erythrophloeum guineense*, *Khaya Klainii* and *senegalensis*, *Dalbergia melanoxylon*, *Piptadenia Kerstingii*, *Detarium senegalense*, *Anogeinus leiocarpus*, *Mimusops multinervis*, *Butyrospermum Parkii*, *Prosopis oblonga*, *Dialium guineense*, *Lophira alata*, *Terminalia dictyoneura* and *macroptera*, *Diospyros mespiliformis*, *Mitragyne macrophylla*, *Limonia Warneckei*, *Parinarium curatellifolium*. Dr. Kersting recommends as suitable for cabinet-makers, *Pentadesma Kerstingii*, *Albizzia Brownei*, *Lonchocarpus sericeus*, *Burkea africana*, *Pseudocedrela Kotschyi*, and *Parinarium Kerstingii*. *Cyanometra megalophylla*, *Ormosia laxiflora*, *Afzelia africana*, *Crossopteryx africana*, *Adina microcephala*, *Cola laurifolia*, and *Faurea speciosa* are specially deserving of notice.—*S. E. W.*

Timber Supply of the United States. By R. S. Kellogg (*U.S.A. Dep. Agr., Forest Service, Circ.* 166, July 1909).—This gives a good idea of, and insight into, the forest resources, the rate at which they are being cut, and the outlook for a future timber supply of the United States.—*A. D. W.*

Timber Trees of Cameroon, The Tall. IV. By E. Gilg (*Not. König. Bot. Berlin*, 45, Nov. 18, 1909, pp. 123-131).—A list of the trees of commercial value found in Cameroon.—*S. E. W.*

Tobacco. By W. H. Scherffius (*U.S.A. Exp. Stn. Kentucky, 20th Rept.* (*Bull.* 129); 1907; plates).—Deals mainly with the methods the farmer may adopt to improve his tobacco crop by selection and the elimination of undesirable varieties.—*F. J. C.*

Tobacco, Cigar-wrapper, under Shade in the Connecticut Valley. By J. B. Stewart (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 138, Dec. 1908; plates).—The method of growing tobacco under the shade of tiffany tents originated in Florida about 1896. In 1900 the Connecticut Agr. Exp. Station and the Bureau of Soils of the U.S.A. Department of Agriculture conducted a joint experiment in this direction, and eventually tobacco was produced from Sumatra seed equal, if not superior, to any imported from the island of Sumatra. Great hopes of a new era of prosperity in Connecticut were immediately aroused, and the area devoted to the new industry rose from 41 acres in 1901 to 700 acres in 1902. Then came a bad season, the crop was a failure and many farmers were ruined. Those who were able to tide over till another season made one more effort to raise a paying crop, thinking that the poor quality of their tobacco had been due merely to the unfavourable season. The results were perhaps even more unsatisfactory than the previous year, and the whole industry was accounted a failure.

The Bureau of Plant Industry now took the matter up, and a series of breeding experiments proved that, as so often happens when seed

is transported from a warm climate to a colder one, the progeny had broken up into many varieties. In one field of 45 acres 29 distinctly different varieties were found and isolated. Every variety bred true to type, and of the 29 only two were found to possess any merit. This showed how the late failures had arisen, and during the last four years the shade-tobacco industry of Connecticut has been established upon a sound and profitable basis. The result of all experience so far seems to be that tobacco can be grown profitably in the Connecticut Valley if the grower will obtain a good strain of seed, sterilize his seed-beds, and attend to various cultural directions which are given in this pamphlet.—*M. L. H.*

Togoland, Useful Plants of. Part II. By G. Volkens (*Not. König. Bot. Berlin*, Appendix xxii. pp. 42-64, Nov. 7, 1909; 13 figs.).—Textile fibres.

Pandanaceae. *Pandanus togoensis* and *P. Kerstingii* bear long tough leaves, which are used in making mats.

Palms. *Raphia vinifera* yields two kinds of fibres, piassive and bast. The former is dearer and less valuable than the fibre from Liberia.

Phoenix spinosa bears fruit resembling dates, but smaller. The feathery leaves are dyed and woven into mats. The leaves of *Elaeis guineensis* are used for roofing huts. The husk of *Cocos nucifera* is valuable as coir, used for making ships' cables. The fibre is also made into cord, carpets, brushes, and woven into belting for machinery.

Borassus flabelliformis yields a substitute for piassive, known as bassine. The leaves of *Hyphaene togoensis* are cut into strips and used in weaving mats, baskets, and hats.

Gramineae. *Zea Mays.* The husks of the maize cobs are used for wrapping up fruit, for stuffing cheap mattresses, cushions, saddles, and chairs, and are of increasing value in paper manufacture. The centre of the cobs from which the corn has been separated is used for fodder, for the manufacture of celluloid, and as the material from which a kind of linoleum is prepared. *Imperata cylindrica* is used for covering huts. *Saccharum officinalis:* the canes from which the juice has been extracted are sent to the paper mill. *Rhytachne Kerstingii* attains a height of 10 feet; the stalks are solid, and are used in making baskets. The empty panicles of *Andropogon Sorghum*, after the grain has been removed, are sold for besoms. *Panicum sanguinale* is woven into hats. The straw of *Oryza sativa* is used in paper manufacture. The ripe stalks of *Pennisetum longisetum* and *P. purpureum* are used for thatching. The roots of *Aristida Adscensionis* are made into brushes in India. The straw from *Sporobolus indicus* is bleached with the fumes from burning sulphur and woven into hats. The common reed *Phragmites vulgaris* is made into coarse mats, and is also used for thatching and covering walls. *Oxytenanthera abyssinica* is a valuable bamboo. The stalks of *Flagellaria indica* are extremely tough, and are used in place of rope. The fibres from the fresh leaves of *Ananassa sativa* can probably be spun like cotton or silk.

Liliaceae. Bowstring hemp is obtained from the leaves of *Sansevieria*. A superior kind of bast is prepared from the leaf-stalks of *Tacca pinnatifida*. The large leaves of *Aframomium* are used for thatching. Coarse rope is made from the bark of species of *Trema* and *Celtis*. *Ficus rokko*, *Entada scandens*, *Brachystegia appendiculata*, *Crotalaria retusa*, *Lannea Barteri*, *Paullinia pinnata*, species of *Corchorus*, *Triumfetta*, *Gewia*, and many of the Malvaceae, including *Hibiscus*, are all sources of valuable fibre. Cotton is also cultivated in Togo.—*S. E. W.*

Town Planting. By A. D. Webster (*Gard. Chron.* xlv. (1909), pp. 220, 262, 400).—Trees and plants for town planting are dealt with by an experienced town-gardener. He points out that the tree that flourishes in one town may not be found suitable in another. While in London the London Plane is best, in Sheffield the Canadian Poplar takes first place, in Manchester the lime, and in colliery districts horse-chestnut and sycamore are important trees. Full directions as to methods of planting, fencing and staking, and on the vexed question of the pruning of town-trees, are given.—*F. J. C.*

Transpiration and the Ascent of Water in Trees under Australian Conditions. By A. S. Ewart and B. Rees (*Ann. Bot.* xxiv. January 1910, pp. 85-105).—The investigations were undertaken to determine (1) the rate of transpiration under Australian conditions; (2) the rate of ascent of sap, more especially in Eucalyptus trees; (3) the length and diameter of the wood-vessels; (4) the condition of the conducting tissue during transpiration; and (5) the maximal and average resistances to flow in functioning stems. An abridged account of the summary given by the authors is as follows:—

The rate of evaporation for each square metre of leaf-surface from cut branches, whether placed in water or not, is always less than from a plant rooted in the soil under otherwise similar conditions. When the air is hot and dry the evaporation from a free surface of water undergoes an enormous increase, but that from a living plant undergoes a regulatory *decrease*, and may be only one-sixth as active as the former. Under optimal conditions a rooted plant of *Eucalyptus corynocalyx* may lose 396 grams of water for each square metre of transpiring leaf-surface an hour, whereas the maximum rate for *Dracaena Draco* was 17·6 grams.

Cut trees always absorb water at a less rate than rooted ones evaporate it. The maximum rate of ascent of sap noted was 12·3 metres an hour (*Eucalyptus viminalis*) and 6·5 metres an hour (*E. amygdalina*), whereas in cut branches of *Eucalyptus* it rarely exceeded 1 to 2 metres an hour.

Single vessels may run nearly from end to end of the main trunk in young *Eucalyptus* and *Acacia* trees several metres high, but only a very small fraction exceed half the main trunk in length. In the branches the vessels are shorter and narrower. The existence of a rapid transpiration current appears to favour the development of broad vessels, but not to affect their length.

Branches containing air taken from actively transpiring trees show a much greater resistance to flow than when saturated with water; and with increasing heads the rate of flow does not increase proportionately.

A coloured liquid will rise slowly in a saturated stem kept in a saturated atmosphere, but a somewhat slower ascent is shown after the stem has been killed, so that the phenomenon is not the result of any vital pumping action, and must be capable of physical explanation, although in a saturated stem it cannot be due to capillarity or imbibition, and is too rapid to be the result of diffusion.

No appreciable rise of sap took place in a tree devoid of its leaves, but a pumping action may only be excited when the leaves are exerting suction on the water in the wood.—*A. D. C.*

Tuberous Solanums, New Examples of Mutation in. (*Rev. Hort.*, Dec. 16, 1909, p. 562).—The wild *Solanum Commersonii* in the hands of M. Planchon, of the Montpelier University, after four years' constancy to type, produced tubers of two kinds, viz. normal and much larger ones about ½-pound weight, of a yellowish colour, with deep eyes and smooth skin, thus displaying a great modification. Both sets of tubers being planted, the apparently normal ones produced plants differing slightly from the wild type, "demi-mutées," while the others yielded quite different plants, completely resembling *S. tuberosum*. Dr. Haeckel, of Marseilles, reports that continued experiments with *S. Maglia* have resulted in the production of varied tubers tending more and more towards those of the cultivated *S. tuberosum*. The results, though two species were concerned, were practically identical as resembling those of a third.—*C. T. D.*

Tulips, A New Race of Branching. By Rev. J. Jacob (*Garden*, Nov. 13, 1909, p. 554 and fig.).—This race of branching tulips was obtained by Mons. Clermont Ferrard. It has from three to five flowers on the main stem.—*H. R. D.*

Turnips, Increase in Weight of. By G. Rivière and Y. Bailhache (*Jour. Soc. Nat. Hort. Fr. Nov.* 1909, p. 652).—Tabulated results of experiments, showing the comparative weight of turnips at different stages of growth, noted with the leaves and without, at certain stated intervals; the idea being to ascertain at what period of the growth of the plant any added nourishment is taken up by the foliage and when by the root.—*M. L. H.*

Ulmus campestris (*Die Gart.* 65, p. 776).—A very interesting specimen, said to be considerably over 1,000 years old; is found near the village of Schimscheim, in the Rhine district. It has a circumference of 15·5 metres, known by the peculiar name of The Rathhaus (Townhall), owing to the fact that during the summer the representatives of the village assemble here and discuss the local affairs.—*G. R.*

Vaccinium, Species of. By W. J. Bean (*Gard. Chron.* xlv. (1909), pp. 49, 74, and 83).—The species of *Vaccinium* that have

been introduced to this country are described, and notes upon their distribution, habitats, and habits are given at length. A few of those introduced, such as *Vaccinium glauco-album*, are hardy only in the most favoured localities in Great Britain, but most may be grown where leaf-mould is available and lime absent from the soil, though all prefer sandy peat and a moist position, and are worthy of cultivation for the generally neat, close habit, handsome fruits, and frequently rich autumnal colouring. The nearly allied cranberries, species of *Oxycoccus*, and *Chiogenes serpyllifolia* (the creeping snowberry) form the subject of a further article on p. 99.—*F. J. C.*

Velvet Bean and its History, The Florida. By K. S. Bort (*U.S.A. Dep. Agr., Bur. Plant. Ind., Bull.* 141, part iii.; May 1909; 3 plates, 1 fig.).—The bulletin contains good illustrations and much documentary evidence on the subject of the history of the velvet bean, stated to be the most important leguminous forage crop grown in Florida.—*V. G. J.*

Veronica Chamaedrys, Tubers on. By J. E. Blomfield and E. J. Schwartz (*Ann. Bot.* xxiv. January 1910, pp. 35-43; 1 plate).—A morphological and cytological account of the life-history of the myxomycete *Sorosphaera veronicae*. The swellings were found on the stems, leaves and petioles. Infection apparently takes place in the region of the growing point. When the invasion is extensive the whole shoot is modified; but when less the growing point frees itself and a tumour is formed on the side of the stem.

Sorosphaera resembles *Plasmodiophora* in its method of growth and also in nuclear details. A Plasmodium-like structure is formed in the host-cells, and this ultimately gives rise to a crop of sorospheres (spore-masses). The plasmodium is not formed by an aggregation of amoebae, but from the growth of a single spore. The infected areas increase in size by the division of already infected cells.—*A. D. C.*

Viburnum Carlesii (*Gard. Chron.* xlv. (1909), pp. 341 and 361; fig.).—The history of this beautiful Chinese *Viburnum*, quite hardy in this country, is given, with notes upon its behaviour in cultivation at Kew.—*F. J. C.*

Wahlenbergia, Species of. By T. Smith (*Gard. Chron.* xlv. (1909), p. 243; figs.).—The author describes the species and varieties of *Wahlenbergia* suitable for cultivation in the rock-garden, and gives hints upon their cultural requirements, insisting upon the need for directing water to the roots of the plants and preventing it from remaining upon the foliage, especially in winter and spring.—*F. J. C.*

White Fly (Aleyrodes citri, &c.). By E. W. Berger (*U.S.A. Exp. Stn. Florida; Rept.* 1908; pp. 48-58).—Fungi for the suppression of this pest on citrus trees have been successfully distributed, and it is concluded that the insects themselves carry the fungus to other

localities. It was found that the insects excrete a considerable quantity of honeydew, and that certain species of ladybird, lacewing flies, etc., frequently feed upon them.

The fungi (see p. 68, *et seq.*) found to attack the white fly are *Aschersonia aleyrodis*, *A. flavo-citrina*, *Sphaerostilbe coccophila*, *Verticillium heterocladum*, *Microcera sp.* and an unrecognized brown fungus.

F. J. C.

White Fly Studies in 1908. By E. W. Berger, Ph.D. (*U.S.A. Exp. Stn. Florida, Bull.* 97; February 1909; 19 figs.).—"Among the natural enemies of insects are fungi, bacteria, and predaceous insects. Bacterial diseases of the white fly are at present unknown, but the known fungus diseases of this insect are seven in number." The bulletin gives an interesting account of the white fly (*Aleyrodes citri*), and describes the methods of combating it by means of infecting its larvæ with the spores of the parasitic fungi.—*V. G. J.*

White Pine Blights, Present Status of the. By P. Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 35, Aug. 1909).—The investigations into the blights to which the white pine (*Pinus Strobus*) is subject suggest that there is little to be alarmed at in the occurrence of this fungoid disease.—*A. D. W.*

Woburn, Eleventh Report, 1910. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S.—This report deals with the nature of copper fungicides, the changes which they undergo when in use, and their action on vegetable organisms. See note under "Fungicides, Copper."—*A. P.*

Woodlands of England. By C. E. Moss, W. M. Rankin, and A. G. Tansley (*New Phytologist*, ix. pp. 113-149; March-April, 1910). —This paper gives a general description of the various types of woodland found in England, and is an outcome of a series of botanical surveys carried out by the authors. After dealing with the difficulties raised through the planting and sylvicultural treatment of our native woods, and the influence of coppicing, the paper goes on to group the woodlands. Three main types of wood are distinguished: (*a*) Alder-willow on wet soils; (*b*) Oak and Birch woods on non-calcareous soils; (*c*) Beech and Ash woods on calcareous soils. Further subdivisions are introduced and their characteristic features and undergrowth are considered. Thus the oak woods become grouped into damp oak woods and dry oak woods; oak-birch-heath woods at low elevations, and very characteristic of Kent, Surrey, and Sussex; birch woods at high elevations. The method of treatment is practically unique, and the paper is free from technical detail, so that it is available for the general reader who is interested in woodlands. The reprint before us may be purchased from the *New Phytologist*, Botany School, Cambridge, price 1*s.* 1*d.*, so that there is no need to attempt to abstract it.

W. G. S.

Woolly Aphis, Sulphur-potash for. By E. E. Pescott (*Journ. Dep. Agr. Vict.*, November 1909, p. 723).—For light attacks of woolly aphis the sulphur-potash paint may be used, and it will give excellent results. The formula is: Dissolve 2 lb. sulphate of potash in ½ gallon of water, and then mix in 2 lb. of sulphur. When a thorough mixture is formed, add sufficient raw linseed oil to dilute it to the consistency of ordinary house paint. It may then be brushed on to the parts affected. This mixture will keep, and, should it thicken, it may again be reduced by the addition of more linseed oil. This is a very effective paint, and is easily handled where the attacks of woolly aphis are too light to warrant the use of the spray-pump.—*C. H. H.*

Yellow or Tulip Poplar. (*U.S.A. Dep. Agr., Forest Service, Circ.* 93, April 1907).—The range, habit, growth, and economic uses of the tulip tree (*Liriodendron tulipifera*), which does well and has attained to large size in various parts of Britain, are here clearly narrated, as is also the propagation and planting.—*A. D. W.*

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PART II.

A BOTANIZING EXPEDITION TO WEST AUSTRALIA IN THE SPRING (OCTOBER), 1909.

By CAPT. A. A. DORRIEN-SMITH, D.S.O.

I.—CAPE NATURALISTE (Lat. 33° 30′ S., Long. 115° E.).

IN September 1909 I left England with my wife for a visit to the Australian States, with the special intention of making as extensive a tour as time permitted through the south-west region of West Australia. I had often heard much about it, especially as regards its flora, the magnificence of which I believe to be unsurpassed. Nothing I have hitherto seen, in spite of all my wanderings, has anything like compared with the glory of this wonderful and curious flora, about which people in this country seem to know so little.

To plant enthusiasts the flora is almost entirely unknown, yet it seems that anyone owning a "Bagshot Heath" or sand-dune of any description should be able to make a show of the types of plants found here, provided the climatic conditions were not too severe.

On our arrival in Perth, West Australia, we were met by Dr. A. Morrison, formerly Government Botanist in the State, who most kindly helped us throughout and, by introducing us to many of his friends, enabled us to become quickly acquainted with the possibilities of our tour. We were also greatly assisted by Mr. Bertoli, of the Lands Department, who arranged for our conveyance across the country.

We started on the third morning after our arrival—*i.e.* October 1, 1909—to the neighbourhood of Cape Naturaliste, about 150 miles south of Perth on the West Coast. The approach is by rail to Busselton, and then a drive of about twenty miles brings you to the Government Bungalow, close to the great limestone caves of Yallingup, which is a very convenient centre from which to study the flora.

From the railway, as we passed along, could be seen masses of flowers on either hand. One of the large species of *Conospermum* was very conspicuous; the local name is Smoke Bush, called so, I suppose, by the settlers on account of the misty smoke-like effect which the plant has when seen at a distance in full flower. Then would appear in masses of bright blue a species of *Leschenaultia*, which is not unknown as an introduced plant in the British Isles. *Anigozanthus Manglesii* also abounded in the moister places, and many other strange plants, which we afterwards had time to observe at leisure. The railway runs along the western slope of the Darling Range between it and the sea on the edge of the limestone and granite, where the forest trees are mostly of a scrubby nature, composed of several kinds of *Eucalyptus*, chiefly *E. marginata* (Jarrah) and *E. patens* (Blackbutt). Soon after leaving Boyanup station the aspect changed, and we ran through a forest of magnificent great trees of *Eucalyptus gomphocephalus* (Tuart), which, with their great white trunks towering up to between 120 ft. and 150 ft. in height, were very striking.

After passing this we came out into swampy land with *Melaleuca* scrub (fig. 90), and thence to the sand-dunes, the township of Busselton, and the sea coast.

We stayed the night at Busselton, then proceeded to drive to Yallingup Cave House, some twenty miles by a road running for some distance parallel to the sea just behind the sand-dunes. The scrub on either side of the road for the first ten miles was very thick, and here there are several small rivers running in sandy semi-swampy courses into the sea, most notable of which is the Vasse River. Its neighbourhood is especially prolific in Leguminous and Myrtaceous plants, especially scrub Acacias, Melaleucas, and *Agonis*; these formed a veritable jungle, through which it was very difficult and prickly to push, the Acacias being largely represented by the sub-genera *Pungentes* and *Bipinnatae*. Occasionally we passed clearings and small settlements, and here *Agonis flexuosa* showed to great advantage, with its thick, short butt, large-headed, much-branched top, and its beautiful weeping habit; it was covered with a mass of small white flowers in axillary heads (fig. 91).

After passing through a large swampy flat covered with a low-growing *Melaleuca*, *Hypocalymma robusta*, Caladenias (terrestrial orchids), and Droseras (sundews), the ground began to rise, and we came upon the first Eucalypti since leaving Busselton, mostly scrub Jarrah and Blackbutt. I noticed a large patch of *Boronia* (pink) growing in a swampy place, and every minute we passed fresh flowering plants, including a large variety of most lovely Pimeleas, the white *Pimelea spectabilis*, and all shades of pink to the bright little *P. ferruginea*; the brilliant blue Dampieras; the yellow Hibbertias and *Conostylis*; and both mauve and yellow Patersonias (fringe lilies), which belong to the Iris family. About six miles of this brought us to the Government Bungalow, situated on the limestone at the head of a small ravine leading to the sea on the West Coast, about nine miles south of Cape Naturaliste.

FIG. 90.—MELALEUCA-XANTHORRHOEA SCRUB.
Cape Naturaliste district.
Left foreground stem of *Banksia attenuata*.

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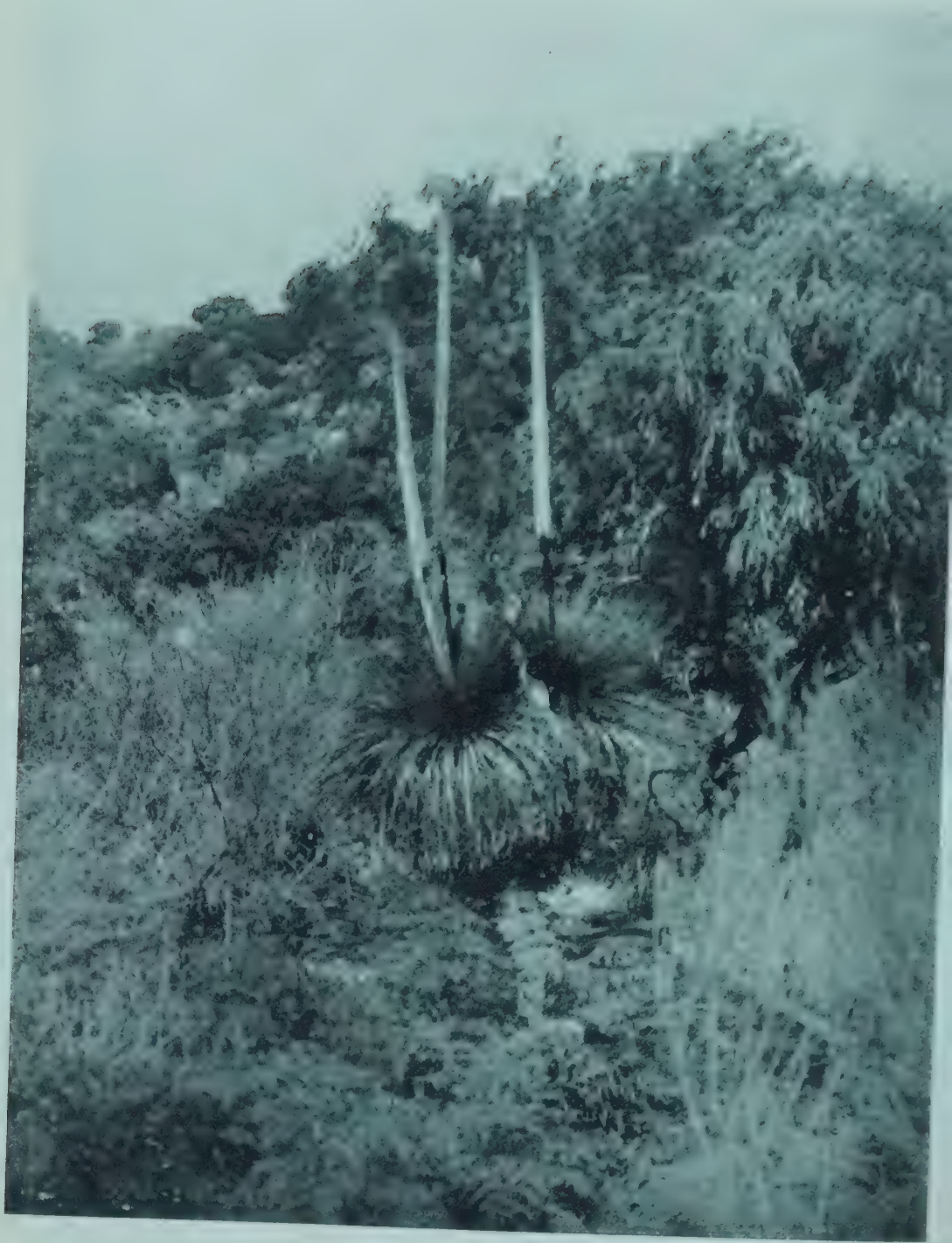

FIG. 91.—XANTHORRHOEA PREISSII, SHOWING FLOWER SPIKES. ON RIGHT AGONIS FLEXUOSA (WEEPING).
Cape Naturaliste district.

Although the plants were more attractive, we thought it advisable to pacify the cave guides at once, and so immediately after lunch we set off with them to see the great limestone caves. These are a wonderful sight and well worth a visit; the caves are lighted by electricity and shown to the best advantage. The stalactites are exceptionally fine in these caves, which are very large, and only rivalled by the Jenolan Caves in the Blue Mountains in New South Wales, which I saw on a former occasion.

Early the next morning we went down the ravine to the seashore. At the mouth of it is a sand-dune on which grow stunted *Melaleuca* and the sea-grass *Spinifex longifolius*, while on the back of the dune grows a shrub about three to four feet tall with a foliage rather like *Correa virens*, but with a pendulous orange and red flower; it was pretty as well as curious, and the flower when crushed gave out a very unpleasant pungent odour. I believe the plant to be *Diplolaena Dampieri*. There were some magnificent Xanthorrhoeas (Black boys) in this ravine.

We stayed at the Cave House two more days and busied ourselves exploring the country all round as well as visiting Cape Naturaliste itself. I hoped to come across *Nageia* (*Podocarpus*) *Drouyniana*, one of the few Taxads which exist in this part of West Australia. It is usually a small shrub, and is chiefly of botanical interest. It grows in isolated patches about this district, but I did not obtain specimens until I returned to Busselton, where it was growing about four miles from the back of the township. All round the Cave House and south towards the Margaret River is an excellent place for collecting; the species are very numerous and present a gorgeous sight when all in flower as we saw them. *Banksia grandis* (fig. 92) is especially fine, and so is *B. attenuata* (fig. 93); then there was a fine holly-leaved *Dryandra*, which was very striking, and several species of *Boronia*, and species of *Tetratheca* with both pink and white flowers. Ferns are only very poorly represented in West Australia; their place is taken by species of *Macrozamia*, *Xanthorrhoea* (fig. 91), and *Kingia* (fig. 94), the first two being very abundant.

I obtained a large number of the *Macrozamia* nuts. They are oval pebble-like seeds and very heavy; as a rule the fruit is borne close to the ground near the centre and crown of the plant, which possesses a wonderful mechanism for discharging them and can hurl them quite twelve feet. In one particular instance which I remember, I was most alarmed by a discharge, and thought I must have offended a forest of monkeys at least, until looking about me I found no monkeys, but that the real cause was *Macrozamia*; the farthest nut I found in this instance was fifteen feet away.

The next day we set off on ponies to visit the lighthouse at Cape Naturaliste and examine the district as we went. We followed the track which leads to the lighthouse, distant about fifteen miles from the Yallingup Cave House. Every yard almost disclosed more flowering plants; the Leguminous plants are very lovely, especially the

Chorizemas and Kennedyas. We found a large patch of *Acacia uncinata*, which I had not seen before in any quantity; and on nearing the lighthouse the country became more open, the vegetation very stunted, and here and there were patches of the blue *Leschenaultia*, a creeping *Dryandra*, a *Calythrix*, and the little iris-like *Sisyrinchium*, while the scrub Jarrah gum was in full flower (white). I had previously written to Mr. Baird, the lighthouse-keeper, to say we were coming, and on arrival we were most hospitably received by Mrs. Baird, who had prepared lunch for us. Mr. and Mrs. Baird are much interested in natural history and plants, so I learnt while there a great deal about the birds of the neighbourhood as well as about some of the plants. After visiting the lighthouse we explored the cliffs and were much struck by finding masses of *Templetonia retusa* in flower; it is a fine thing, and the flower very much resembles the well-known New Zealand plant *Clianthus puniceus*.

The northern sheltered side of the Cape is densely covered with some very fine Melaleucas (fig. 95), but the species I did not identify.

Returning again to the lighthouse we saddled our ponies and started on our return journey to the Cave House, but were very sorry to leave, and felt we could have profitably spent at least two days here. Mr. and Mrs. Baird were most kind to us, and have already fulfilled their promise to send home seeds. On this day I had a very heavy collection of specimens and several plants, and was exceedingly glad that my pony had to bear the brunt of the weight and not myself; but I feel we were well rewarded for our long outing.

The next day was spent in pressing specimens and photographing various shrubs and trees, and the evening found us again in Busselton. Thus ended our first insight into the flora of South-Western Australia, over which I was greatly dazzled and much confused; but its magnificence has left a very deep impression.

II.—From Bridgetown (Lat. 34° S., Long. 116° E.) to Stirling Range (Lat. 34° 30′ S., Long. 118° 15′ E.).

After leaving Busselton we proceeded to Bridgetown by train, where we started for a cross-country drive. The country may be described as one vast sand heap, underlying which is either granite or limestone, which appears on the surface in places. The vegetation is mostly composed of large forest trees (*Eucalyptus*) or small shrubs, mainly of a heath-like appearance, and where the Eucalypti are more scattered, there the shrubs abound; but even the floor of the densest gum forest is by no means bare (fig. 96). I was most kindly assisted by the Lands Department here, who took considerable trouble to insure that we should have a suitable outfit for our cross-country drive.

Having got all the plant-collecting material, stores, and horse food piled on our buggy, we left Bridgetown on October 7, and did fourteen miles in an easterly direction to our first camp towards Kojonup. Mr. Maiden, Government Botanist of New South Wales, and his wife had

FIG. 92.—BANKSIA GRANDIS.
Cape Naturaliste district.

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Fig. 93.—Banksia attenuata.
Cape Naturaliste district.

FIG. 94.—BLACK BOYS (XANTHORRHOEA PREISSII) AND SILVERY KINGIAS (KINGIA AUSTRALIS).

FIG. 95.—GIANT MELALEUCA.
Cape Naturaliste district.

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joined us at Bridgetown, and came with us to our first camp; but unfortunately the weather was so bad that he was, owing to his health, unable to continue, and I sent them the next day to the nearest railway siding in time to catch the daily train towards Perth. It rained all that day till 4 P.M., so we did not shift camp. We, however, got a good many specimens of plants—Hibbertias, Hakeas, Dryandras, Leucopogons, and the brilliant blue Dampieras, and many very bright-flowering Leguminous plants. On the 9th we got away from our wet camp about 10 A.M. betweeen two squalls, and until we got near the Blackwood River fresh plants were scarce. We made a midday halt on the Blackwood, and poked about there for a couple of hours. The squalls were very heavy, and it hailed like mad; but towards the evening the weather improved, and we reached a homestead belonging to our driver's brother, who most hospitably took us in.

The country all about this place, Dinninup, is becoming more settled. The land when cleared is good, and there is good grass of native sorts, but very few introduced grasses yet. The soil being derived from granite dries very quickly in the summer, and the introduced grass does not have a chance, especially when the farmer finds he cannot afford to shut a paddock off from the stock and give the new grass an opportunity of establishing itself. Introduced grasses, therefore, are said not to do; but I feel sure this is really not the case, by the fact of the presence of introduced grasses invariably found in small paddocks and gardens around the homestead, where stock are not usually turned in, except as casuals.

On the 10th we drove thirty-six miles into Kojonup, and had a rather long but most interesting day. It was, for instance, our first introduction to the gorgeous red *Leschenaultia*, which is inclined to spread itself over the ground, somewhat after the manner of *Lotus peliorynchus*, but outrivalling it altogether in colour effect. The track about midday became rather heavy and boggy, and we nearly got stuck up once or twice; but we found a great many plants which were new to us, especially in a small open patch, just after we passed through the worst bit of bog. These plants turned out to be a small outlying patch of the flora of the sand-plains, so distinct from that found in the gum forest. After the midday halt, we had a journey of only about sixteen miles into Kojonup. The white gum, *Eucalyptus redunca*, began to take the place of the Jarrah and red gum, and we found a Kangaroo Paw (*Anigozanthus*) new to us.

The Kangaroo Paw is peculiar to West Australia, and is a most remarkable plant. It has a few small, short, iris-like leaves, and shoots up a flower-stalk (in *A. Manglesii*) 2½ feet high, resembling a hand or paw, the knuckles of which are red plush, and the fingers green plush. The variety we found on this occasion was of a terra-cotta colour. There are others—green, black, and pale yellow, and entirely yellow.

Arrived at Kojonup (10th) we proceeded to wash and brush up and get things dry, press plant-specimens, change the papers on others,

and replenish our stores. Our driver had now got out of his district so we had for the future to rely on our maps and any other information we could pick up; and on the 11th we started off towards Cranbrook for a twenty-two mile drive, to the first river, marked Slab Hutt Gully, where I knew a Mr. Tunney lived, to whom I had an introduction from Mr. Woodward, the Curator of the Perth Museum. Mr. Tunney received us most hospitably, and I gained a great deal of information about the district, and also something of the North-West Territory, in which he had spent several years of his life, wandering and collecting the fauna for various museums, &c.

About three miles on the Kojonup side of the gully we came upon more open patches of country, and the sand-plain flora in particular in all its glory (fig. 97). The yellow *Verticordia*; a small smoke-bush (*Conospermum*), a heath-like scrub, with a mass of small white cottony flowers; *Beaufortia* (scarlet after the manner of *Callistemon*); *Billardiera*, a red bell-flowered creeper, which twined itself about the taller of the low-growing scrub; Gastrolobiums, with their bright pea-flowers, many species of which are poisonous to stock; *Kunzea*, *Calythrix*, *Andersonia*, the bright-blue Dampieras and *Leschenaultia*; of all the brilliant flowers I believe the red and blue *Leschenaultia* holds the field. We also saw many white-flowered Epacrids, and the *Scilla*-like *Chamaescilla corymbosa*, with its crinkly foliage, varying from green at the base to brick-red at the tips, with beautiful bright-blue flower head, some four or five inches high; the orange-flowered *Bossiaea*, Davesias, Hakeas, Grevilleas, terrestrial Orchids, Droseras, and many other things.

The Orchids and Droseras seem to grow anywhere and everywhere, in swamps, on sand-heaps, or mountain-tops alike; but the species seem to be ever changing, and their flowers are very lovely, especially the latter, which were white, red, coral, mauve, and yellow.

On the 12th we went on eighteen miles to Cranbrook, where we met with the Great Southern Railway, and stayed two nights. The water was bad, but submitted to boiling, and the proprietor of the local hotel let us have some water from his tank to make the tea with. We scoured the sand-plain for plants, and found many new ones, especially the Banksias, Dryandras, scrub Hakeas, Melaleucas, Lambertias, and the flame-flowered *Eremaea*. I managed to get seeds of some of the species about here, but on the whole we have not got many seeds, as it is too early, and only the hard-wooded seeds of last year are obtainable. We heard that we were not likely to find much water in the Stirling Range, and the next day this proved correct, when we pushed on twenty-three miles to a "well." It was the worst smelling water I have ever experienced, which is saying a good deal. Situated in a boggy place, the well had been riveted with green gum timbers, which had turned the water a purplish-black, like ink. Needless to say, the horses would not touch it, but after boiling it twice, and throwing in tea, we managed to drink a little. All this day we drove over the sand-plains, along the north side of the hills. The Stirling Range is an isolated patch of Silurian rocks, which rise abruptly out of the plain, and are devoid

of gushing streams or luxurious vegetation. The highest is Bluff Peak, marked 3600 feet on the map. On the sand-plain there is a low gum-scrub, large numbers of Hakeas, Banksias, Leucopogons, Dryandras, and Beaufortias, and when crossing the spur of a hill we found the beautiful blue *Dampiera eriocephala*, with foliage somewhat resembling an Auricula.

We did not even wait to press plants at this camp, but pushed on early, thirteen miles further, and found a veritable oasis in the desert, a homestead and good water, and delightful camp at Warrungup (fig. 98). You may notice that nearly all the names of places end in "up." This termination in the words of the native black means a perpetual spring—a welcome sign on any map in such a sand-desert.

At Warrungup we found Mr. Welstead, the owner, who was most kind to us and gave us milk in plenty, and told us all about the locality, advising us first to ascend Warrungup Hill, 2800 feet, where we should find the "Mountain Bell," the most beautiful flower he had ever seen.

The next day, the 16th, we ascended and had a stiff climb, but I never saw any garden, wild or otherwise, to equal the flowers on this hill, which, composed of Silurian rocks and shales, was very stony, and generally could be best described as a vast arid shingle slip, with the scrub growing through it. We found the "Mountain Bell" very near the base of the hill, and it proved to be a *Darwinia*, with its beautiful pink bell-like flowers; it grew in the shade of the lovely white Epacrid *Lysinema* (fig. 99), and close by were glorious bushes, eight feet tall, of the striking Protead *Isopogon latifolius*, with cones of pink flowers (fig. 100). We found also *Dryandra formosa*, a mass of golden-yellow flowers (fig. 99); and a species of *Beaufortia*, as well as a yellow *Melaleuca*, *Dampiera eriocephala*, a climbing *Stylidium*, with a flower-head like a pink *Phlox*, and many other Myrtaceous and Epacridaceous plants, and perhaps least, but yet none the less glorious sight on the top of the mountain, a species of *Utricularia*, and a beautiful crimson Orchid, an inch high. I should also mention a mauve pea-flowered shrub, called *Burtonia;* a fern, *Asplenium flabellifolium*, to say nothing of the various Gastrolobiums, with their many-coloured pea-flowers.

Having climbed to the summit of the hill, we obtained a fine view of Mount Toolbrunup to the south and the whole range stretching east and west, while away on the sand-plains we counted over fifty lakes, which we knew too well were all salt. In the far distance to the south-east we could see the sea near Cape Riche, forty-five miles off. This, again, is a most interesting district; but, unfortunately, we had no time to visit it.

We thoroughly examined the ridge, collected what seeds we could find, and then descended the hill on the west side. Our driver, who had never seen a real mountain before, came with us and acted as water-carrier, there being not a drop on the hill; he caused us much amusement when we came to a shingle slip, as he had no

idea of how to negotiate it, and was much alarmed at its steepness and puzzled as to how we slid down so quickly and safely. At the bottom we saw masses of a heath-like blue-flowering shrub, which, on examination, turned out to be a *Conospermum*, quite unlike any of the other species we had previously seen. Not very far away we obtained our first sight of *Banksia coccinea*, a truly beautiful little *Banksia* with brilliant scarlet cones of flowers. We then wended our way through the scrub gums to our camp, which we reached about 6 P.M.

On the 17th we pressed specimens, cracked seeds, and rested, and planned attacks on Mount Toolbrunup, 3400 feet high.

On the 18th we moved on nine miles and surveyed the country round our new camp. We found a large bushy *Pimelea*, *Xanthosia rotundifolia* (the Southern Grass-flower), both white and very pretty, as well as many Leucopogons and a very brilliant *Chorizema*, and also the lovely blue *Platytheca galioides*, a heath-like plant about eighteen inches high. We further speculated on the prospects of getting up Toolbrunup, which is very rocky, terminating in a sharp cone for the last 300 feet, and can only be ascended at certain points. We found here fine specimens of the silvery-foliaged *Kingia*, which is by far the most graceful of all the "Black-boy" tribe (fig. 101).

The 19th broke thick and bad, with no hilltops to be seen, but about 10 A.M. it cleared, and we rode our horses to the foot of Toolbrunup, about three miles off, and tied them up. On the way we found *Banksia Brownii*, remarkable for its pinnate leaves and the great size of its flower; another *Banksia*, which we have not identified; a *Bossaea*, and *Aotus gracillima*. We climbed to within 300 feet of the top of the cone by a spur from the eastern side, had lunch, and got ready for the final climb, when down came the clouds and deluges of rain. We waited till 3 P.M. for it to clear, as we could not go on in the mist, and then scrambled down again by a deep gully, found the horses, and got into camp at 5.30 P.M. The flora on this hill was good, but not to be compared with that on Warrungup. We found scrub-gum at a height of over 3000 feet and a veritable jungle of a species of *Thomasia*, an *Acacia*, the name of which I do not know, and a variety of *Acacia longifolia* out of flower; also a *Mirbelia*, a mauve pea-flowered prickly bush, which I am told makes a good hedge, but I did not see it in cultivation. On the plain at the foot of the hill we came across masses of the magnificent *Banksia coccinea*, which is a small slender-growing plant, generally single-stemmed, sometimes branched, with a maximum height of ten feet.

On the 20th we reached Mount Barker, on the railway, distance thirty-six miles, finding little that was new across this bit of sand-plain country, mainly because it was completely devastated by fire as far as the Kalgan River. On the south side of the river the country was more settled, and we passed many fruit orchards, looking prosperous and well-grown, and from what I saw of the fruit districts generally I should say there was a great future before the industry. Wheat-growing is ever on the increase, and the crops looked well. Agriculturally

FIG. 96.—EUCALYPTUS CALOPHYLLA, THE RED GUM OF WEST AUSTRALIA.

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Fig. 97.—Giant Dryandra of the Sand Plains, Scrub Jarrah, and Xanthorrhoea gracilis.

FIG. 98.—THE OASIS IN THE DESERT. WARRUNGUP HILL BEHIND, "JAMWOOD" ACACIA IN FOREGROUND

FIG. 99.—THE GIANT EPACRID, LYSINEMA CILIATUM; TO THE LEFT DRYANDRA FORMOSA.

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this State is far more backward than any of the others, but the soil for the most part is good, in spite of its sandy appearance. Besides the great timber industry in Karri and Jarrah, &c., there are two others which are connected with the forestry which are important. One is the sandal-wood, so much in request in the East, but which seems likely to soon become wiped out; the other is mallat-bark (*Eucalyptus occidentalis*), used for tanning. I came across considerable quantities of this gum-tree growing near Kojonup, especially near Slab Hutt Gully. This gum reafforests itself very quickly, especially after a fire has been through it. I was shown dense masses of it only seven years old, which now is ten to twelve feet in height. There is at present probably little chance of the plant being exterminated, but there is no restriction on the size of the plant stripped and killed, and if it is all stripped before it comes into fruit-bearing it stands to reason that the plant may become wiped out and a useful industry destroyed.

On the 21st we parted with Mr. Blechynden, our excellent driver and guide, and his team with many regrets. He had a lonely drive of 135 miles back to Bridgetown, while we had a fourteen hours' journey, covering 302 miles, to Perth, where we arrived safely. Dr. A. Morrison very kindly took over all the plant specimens in order to get them thoroughly dry before sending them to England. In our three weeks' tour we got a vast collection of perhaps some 500 specimens. Altogether we had a most delightful trip, which was all too short, but long enough to get an insight into the flora of the South-West, where the rainfall is from twenty-five to forty-five inches, and where I am in hopes of being able to get many plants in the future, which could be grown in favoured gardens in the British Isles.

There is a fine field for research still left for anyone who is an enthusiastic botanist, and who would take up the study of the West Australian flora. The tropical regions especially are practically untouched, and some one is badly wanted who will work up this most varied and interesting flora, the standard work upon which is still Bentham and Mueller's "Flora Australensis." So recently as 1902 Messrs. Diels and Pritzel visited West Australia and added some 240 new species in a comparatively short expedition through the best-known parts of the southern floral area, a fact that will give some idea of what is still to be done in this region.

TREES AND GARDENS AT ATHENS.

By D. S. Fish, F.R.H.S.

On entering the port of Piraeus one becomes aware of the strong scent of the Aleppo Pine (*Pinus halepensis*) that grows so freely on the hills around Athens. This tree is valued for its resin, which is put to a variety of uses, including even the flavouring of wine, the renowned "retsinato" being impregnated with this substance.

In order to obtain the resin, the trunks of the trees are rudely slashed, many of the cuts being two or three feet long. This is probably why the trees around Athens never reach a large size.

As the Aleppo Pine and the Cypress (*Cupressus sempervirens*) withstand the heat and dryness of the summer better than any other tree yet tried, they are still extensively planted. Although the Acropolis is treeless a good deal of trouble has been taken to form plantations (unfortunately of a highly inflammable nature) on the steep slopes of Mount Lyabettos.

Towards the base of the hill of Philoppapos also, many Pines and Cypresses have been set out. Near the so-called Prison of Socrates many shallow holes were noticed, in which trees had not, for some reason or other, been planted. Last August each little pit contained several sturdy plants of Barnaby's Thistle (*Centaurea solstitialis*), the bright yellow flowers of which created a somewhat curious effect, as the plants grew only in the holes made for the trees, the intervening ground probably being too hard and too dry for them at that time of the year.

Only in one or two instances are trees present to add to the beauty of the ancient monuments of Athens. The handsome columns of the Olympieion (fig. 102) are certainly seen at their best when viewed from behind the Cypresses near the Arch of Hadrian.

According to the Greek legend, Cecrops, the founder of Athens, brought the Olive, about 1600 B.C., from Sais, an Egyptian city dedicated to Minerva. In the Erechtheion on the Acropolis a young Olive tree is growing on the spot where it is said that Athena victoriously strove with Possidon. It occupies the place of the celebrated Olive tree called forth by the goddess and which was partially destroyed by the Persians in B.C. 480.

As in bygone days, Oleanders cover the banks and sometimes the bed of the Ilissos (dry in the summer). The showy pink flowers of this shrub, together with the purple Chaste tree (*Vitex Agnus-castus*), enliven the rivers and streams throughout Greece. The pretty ivy-like *Cynanchum acutum* frequently climbs over the *Vitex*.

The street avenues of the graceful Pepper tree (*Schinus molle*), with its weeping branches of fern-like leaves and coral-red berries, cannot

fail to attract attention. This tree is unaffected by dust or heat, and it associates well with marble buildings on either side. The specimens selected for street avenue planting should be mainly female, as the berries are decorative.

The finest avenue of weeping Pepper trees at Athens runs between the Royal Palace and the Arch of Hadrian. The street is about 30 feet wide and the trees are 8 to 10 feet apart in the lines. From this pleasantly shaded street one obtains a fine view of the cone-shaped Mount Lyabettos.

The two principal squares of Athens—the Place de la Constitution and the Place de la Concorde—contain quick-growing trees, such as Cypresses, Oranges, Palms, and Carobs, but nothing of particular interest.

The remains of what was probably once a small public garden exist near the Theseion. Only drought-resisting trees and shrubs, such as *Ligustrum japonicum*, Eucalypti, *Celtis*, *Euonymus*, and the common Box remain. *Caesalpinia Gilliesii*, a shrub with Mimosa-like leaves and somewhat striking yellow flowers, is plentiful. As in Egypt and in other countries with a dry atmosphere, this *Caesalpinia* has spread, in spite of drought and neglect. It has lately been highly recommended in Tunis as a bee-plant, but at Athens the bees show a marked preference for the Wild Thyme, which grows on Mount Hymettos and elsewhere.

Nicotiana glauca—the Tree Tobacco—is also becoming naturalized. It is an interesting and singular plant from Buenos Ayres, bearing no resemblance to the ordinary Tobacco, having yellow flowers like a *Cestrum* and smooth and glaucous leaves not unlike those of *Phytolacca dioica*. On the Riviera it is commonly cultivated as an ornamental tree (10 to 30 feet tall). It is naturalized in many countries. Around Alexandria it forms a conspicuous feature during the summer months when other vegetation has perished from the effects of the heat. In Chios it may be seen growing from cracks in the street pavements.

The garden attached to the Royal Palace at Athens (fig. 103) was laid out by Queen Amalia. It is open to the public on Sunday, Wednesday, and Saturday afternoons. The grounds are watered by means of a canal made in ancient times. Practically the whole garden consists of a thick shrubbery penetrated by winding alleys. The tangled growth is composed mainly of Pines, Cypresses, *Ligustrum japonicum*, Olive and Pepper trees underplanted with various shrubs such as the White Jasmine, &c. Near the Palace there is an open space laid down in grass and planted with various Palms, the trunks of one or two of which are covered with Ivy. A pergola (fig. 104), built of stone and iron, is adorned with Roses, Honeysuckles, and *Dioclea glycinoides*: the last a slender twining plant with small red flowers.

The Public Garden is close to the Palace. It consists of a series of crowded shrubberies interspersed with open spaces. Orange trees grown as standards line some of the paths. The Aleppo Pine is used here as a hedge to protect beds of roses. The typical form of *Althaea*

syriacus is a conspicuous shrub; the purple colouring of its flowers cannot, however, be admired.

The uninviting appearance of the Public Garden is due to the overcrowding of the trees and shrubs, and also to the absence of lawns. The Bermuda Grass (*Cynodon Dactylon*), which makes excellent lawns in Egypt, is not utilized for this purpose at Athens, although it occurs as a weed. The summers are too hot for ryegrass or other English lawn grasses.

The Botanic Garden, Athens.

The Botanic Garden (fig. 105) lies about fifteen minutes from the centre of the town. It is divided into two parts—a collection of plants used for teaching purposes, and a nursery of young trees. No uncommon species were noticed in the nursery.

The part which is supposed to be systematically arranged is confusing, as trees and herbaceous plants have been planted together, and the former allowed to grow unchecked. It must, however, be admitted that the Garden owes its interest to the trees and shrubs which it contains.

By far the most beautiful plant in flower last midsummer was *Solanum Rantonnetii (japonicum)*, an Argentine shrub three to five feet high, with showy purplish flowers.

August is certainly not a month in which to look for herbaceous plants at Athens, but the common Soapwort (*Saponaria officinalis*) was in full flower, notwithstanding the heat and dust. *Convolvulus mauritanicus* formed mats of brilliant blue flowers.

A large collection of bulbs, chiefly Crocuses, are grown in pots. These would be interesting in the spring. Stronger growing bulbous plants, such as the Saffron and *Pancratium odoratissimum*, are cultivated in the open.

There are two avenues of Palms in the Botanic Garden—one of *Phoenix canariensis*, and one of *Trachycarpus excelsa*. The effect of the latter is spoilt by the trees on one side being taller than those on the other.

The undermentioned are among the most conspicuous trees:—

Acacia linearis, 11 feet, very thickly hung with seed pods; *Phillyrea media*, 11 feet; *Yucca aloifolia Draconis*, 10 feet; *Fontanesia phillyraeoides*, a graceful specimen, with wide-spreading weeping branches; and the Osage Orange (*Maclura aurantiaca*), 15 feet, with abundance of its curious, orange-like but inedible fruit.

The Golden Olive (*Olea chrysophylla*) is represented by a well-fruited specimen about 16 feet high. This species resembles the common Olive in habit, but the undersides of the leaves are dull yellow. Good examples may be seen at Cairo, though fruiting specimens are rare there.

The Pistachio Nut (*Pistacia vera*) is well grown, and is quite ornamental during July and August, the branches being then laden with rose-coloured fruit. *Celtis australis* and *C. Tournefortii*, with hornbeam-like foliage, are also attractive trees during the summer months.

FIG. 100.—ISOPOGON LATIFOLIUS IN FLOWER ON WARRUNGUP HILL, WITH MT. TOOLBRUNUP TO SOUTH IN DISTANCE.

(*To face page* 296.)

Fig. 101.—A View of Mt. Toolbrunup from near Camp, on N.E. side.

Fig. 102.—The Olympieion, Athens.

Fig. 103. - Palace Garden, Athens.

The former produces the fruit known in Greece as Honeyberries, and is supposed to be the Lotus described by Homer as so delicate as to make those who ate them (Lotophagi) forget their native country. The Jujube tree (*Zizyphus vulgaris*) and the European Date Plum (*Diospyros Lotus*) grow well.

Other trees and shrubs noticed were: *Pistacia Terebinthus*, *Celastrus multiflorus*, *Coriaria myrtifolia*, *Cordia Myxa* (the berries are full of viscid matter, and make good bird-lime), *Rhamnus Alaternus*, *Koelreuteria paniculata*, *Opuntia brasiliensis*, *O. albicans*, *O. Kleiniae*, *O. monocantha*, *Bupleurum fruticosa*, *Ptelea trifoliata*, *Photinia glabra*, *Laurus nobilis*, *Buxus sempervirens*, *Ulmus compestris*, &c., and *Phytolacca dioica*, the Bella Sombra of Buenos Ayres, a tree remarkable because of its thick stems; it thrives where many other trees will not grow.

Climbing plants are mostly represented by *Periploca graeca*, *Celastrus scandens*, and the graceful *Abobra viridiflora*, with its dark-green, much divided leaves. *Bignonia Tweediana* is also conspicuous, draping several of the trees.

George Maw, the monographer of the genus *Crocus*, visited the Athens Botanic Garden in the 'seventies, and in the Transactions of the Botanical Society of Edinburgh he gave a list of some of the plants then in the Garden: *Biota orientalis*, *Cupressus horizontalis*, *C. Tournefortii*, *Crataegus japonica*, *Juniperus attica*, *Gleditschia triacanthos*, *G. ferox*, *Anthyllis Barba-Jovis*, *Ebenus cretica*, *Photinia arbutifolia*, *P. serrulata*, *Maclura aurantiaca*, *Cocculus laurifolius*, *Rhus viminalis*, *Ulmus suberosa*, *U. excelsa*, *Melianthus minor*, *Olea chrysophylla*, *Solanum auriculatum*, *Viburnum suspensum*, and beds of Saffron (*Crocus sativus*).

Some of the plants mentioned by Maw have disappeared; others still remain. For instance, the plants of *Olea chrysophylla* and *Maclura aurantiaca* existing to-day are the identical specimens noticed by him over thirty years ago.

One cannot help regretting that nothing has been done towards making a speciality of certain plants adaptable to the climatic conditions. What good collections of succulent and other xerophilous plants could be formed at Athens!

Kephisia.

Vegetation is much more luxuriant at Kephisia than at Athens, and this is not surprising, as Kephisia lies at a considerable elevation above sea-level. Communication with the capital by train is both easy and rapid, and Kephisia has become a favourite excursion from Athens. Kephisia was already a summer resort in Roman times. Good avenues of trees shade the roads. The climate and gardens remind one of Ireland. Roses are at their best early in the summer. Fruit trees and all kinds of vegetables grow with the same ease as at home. Raspberries were noticed in full bearing.

Kephisia is a good starting point for Tatoi, the King's summer

residence, and also for Mount Pentilikon, a delightful excursion even during the summer. Masses of Terebinth, Dwarf Oaks, Heaths, Wild Olive, *Pistacia Lentiscus*, and *Arbutus*, which, under the name of *Myathis*, was once sacred to the goddess Aphrodite, are conspicuous features of the mountain vegetation. The *Arbutus* is occasionally uprooted and sent to Alexandria, where it is sold as a fruit tree to unsuspecting amateurs.

On the lower slopes of Mount Pentilikon *Poterium spinosum* forms springy cushions sometimes three feet across. Cultivated plants of this Poterium used to be plentiful on a small rockery in the Botanic Garden at Rome, but they were never so large as those which occur in a wild state in Greece, &c.

The delicious odour of the mountain air is due to Cistus, Pines, and the Wild Thyme (*Thymus capitatus*), from which the bees make the famed Hymettos honey. As a matter of fact, this plant is by no means confined to Mount Hymettos; it occurs on most hills, and is also found in the lowlands, where, as at Olympia, for instance, it loses its prostrate habit and becomes an erect shrub one foot to two feet tall, flowering throughout the summer months. *Thymus capitatus* is sometimes used for edging paths in Greek gardens. *Gazania*, *Vinca*, an ornamental grass (*Pennisetum longistylum*), and, strange to say, the Lucerne are also employed for this purpose.

III. PALACE GARDEN, ATHENS.

THE WILD FLOWERS OF THE WEST OF IRELAND AND THEIR HISTORY.

By R. Lloyd Praeger, B.A.

[Read April 19, 1910.]

In the course of a lecture on Rock Gardens, which I had the honour of delivering before this Society last year, I referred to the natural rock gardens of the district of Burren in the county of Clare, and to the remarkable flora which colonizes the bare limestone hills of that region. What I said on that occasion seems to have excited some interest, as I received subsequently more than one letter from members of the audience concerning the Burren and its plants. I have therefore ventured to think that a rather fuller description of that very remarkable botanical region, the West of Ireland, may prove of interest. It may perhaps be thought that a lecture on botanical geography, rather than on a horticultural subject, is not altogether suitable for this Society. But I do not think the contention can be sustained. He is indeed a poor horticulturist who is content merely to cultivate his rare species without wishing to know where they come from, under what conditions they grow naturally, and what has been their history and their migrations since the distant period of their appearance. In studying our native British plants we find ourselves faced by many of the great problems relating to the vegetation of the world; and in this connection the West of Ireland is of especial interest, as there we may collect evidence of long-past plant migrations of a quite dramatic character, which give us some idea of the great changes of fortune which the flora of these islands has undergone.

The vegetation which we find clothing any area is the result of two main factors. The first of these is the past history of the region, especially as regards changes in the distribution of land and sea, and of temperature, which have permitted or prevented the migration of species. The other is its present condition as regards meteorological and edaphic (soil) conditions. Before we attempt to trace the history of the flora of an area, therefore, we must first know the history of the area itself. If we wish to understand the composition of the assemblage of plants which we now find in the valleys and on the hills of our islands, our first inquiries must centre round the geology of the country. We must build up our land before we can build up its flora. In this connection we must first of all realize how closely connected Ireland and Great Britain are both with each other and with the Continent. Both stand on the continental shelf, and the depth of the water which cuts them off is as nothing compared with the abyss which yawns on the westward and which extends across to America. A comparatively

slight elevation would drain the water off the submerged lands which form the Irish Sea and the German Ocean, and restore a continuous continental edge extending from the Pyrenees to the West Coast of Ireland and thence northward towards Scandinavia. We have to deal, then, with a continental shelf, in connection with which, the geologists tell us, there is abundant evidence of fluctuations of level in past ages.

To go back to a very distant epoch, we find that at the close of the Silurian period the earth's crust along the continental edge was subjected to severe pressure from the north-west and south-east, which threw the surface into a series of great folds running at right angles to the direction of thrust—namely, north-east and south-west. This folding formed the great mountain ranges and valleys of Scotland which still give to that country its character; and in the West of Ireland the county of Donegal was similarly crumpled, as were portions of Mayo and Galway; and far to the northward Scandinavia owes its present contour to the same mighty folding. On the land thus uplifted extensive lakes formed later on, and during the succeeding Devonian period a great thickness of sandstones and slates was laid down on the lake bottoms. The land sank at length, the sea flowed again over much of the British Isles; and during the Carboniferous period which succeeded, the greater part of Ireland was thickly covered with a vast series of limestones and shales laid down on a surface now deeply submerged beneath the ocean. Again the land rose—we are now passing by millions of years in as many seconds—and once more a period of severe earth-pressure set in, folding not only the old rocks already distorted by the former period of pressure, but also, in a notable degree, the Devonian and Carboniferous rocks that now overlay them. The result is seen on a glorious scale in the south-west of Ireland, in the vast ribs of slate and sandstone rocks that form the mountain ranges and promontories of Kerry and Cork, and the deep corresponding valleys where alone are left traces of the Carboniferous limestone which formerly covered the country. Thus, then, are the three great mountain districts of western Ireland accounted for, those of Donegal and of Mayo-Galway owing their origin to the earlier, and that of Kerry-Cork to the later period of crumpling. In the spaces between these three great buttresses of ancient uplifted rock, the Carboniferous beds, more destructible, reposed in a more or less undisturbed condition; and the Atlantic, beating incessantly against the western coast, and the rains dissolving the limestone have together worn down and eaten out these softer rocks, so that the country covered by them now presents green plains and deep sea-inlets, contrasting with the heathery heights and bold promontories of the folded areas of harder rocks.

We are in a position now to turn to the botany of this region. We see that ancient geological changes have provided for the plants an area in which tracts largely covered with limestone, and mostly low in elevation, alternate with mountainous tracts of rocks other than limestone, two main types of plant-habitat being thus provided; and we

Photo: R. Welch.

FIG. 106.—MEDITERRANEAN HEATH (ERICA MEDITERRANEA).
6 ft. tall, Mallaranny, West Mayo.

(*To face page* 300.)

FIG. 107.—THE PIPEWORT (ERIOCAULON SEPTANGULARE). *Photo: R. Welch*
NEAR BOWDLSTONE, CUMBERLAND

know that, at some period which is comparatively recent, our islands still joined the mainland of Europe, allowing the continental plants free access to our area.

There is much evidence to show that the last land connection between Ireland and Great Britain broke down before the last land connection which joined Great Britain to the Continent; in other words, that Ireland became an island before Great Britain did. In this way we account for the absence from Ireland of many wide-spread English plants, and also of certain common English animals, such as the mole, all the voles, the weasel, the common toad, the ringed snake, adder, and slow-worm. These, it must be assumed, migrated from the Continent into Great Britain comparatively late, and reached the edge of the Irish Sea too late to cross by the former land-bridge. And so, in the main, just as the flora of Great Britain is a reduced continental one, so the flora of Ireland is a reduced British one. Once the land-bridges were gone, migration was checked; but questions of climate, situation, and soil within our area exercised a profound influence on the distribution of the plants, controlling and guiding the spreading of the various species. Thus the climate of eastern England most nearly corresponds, in its warmer, drier summers and colder winters, with that of the adjoining parts of the Continent, and the eastern parts of Ireland similarly most resemble England; in the flora corresponding similarities will be found. By the time the West of Ireland is reached, almost all the plants which love a hot summer and a dry soil have been left behind, and the characteristic flora is one which can endure a peaty soil and a heavy rainfall, and which can face with equanimity a summer no warmer than that of Finland, and a winter resembling that of the Mediterranean. The last point—the question of temperature—is one of great importance. In the West of Ireland in winter snow is rare and hard frost unknown; a succession of westerly gales, with rain, mist, and cloud, sweep in from the Atlantic, and the summer is also comparatively sunless, moist, and cool. The influence of these conditions on the vegetation is very marked, as is likewise the bold grouping of limestone and of non-calcareous rocks, of which mention has already been made.

Let us now take a few typical bits of the West of Ireland, and study them and their flora in greater detail.

The western part of the county of Galway, known as Connemara, together with the western part of Mayo, forms one of the great projecting buttresses of ancient rocks already referred to. This is a region of bog, lake, and rock, with many fine mountain groups and vast houseless and fenceless stretches of moorland. The mountains are rugged and bare, and not so rich in alpine plants as corresponding hills in Scotland; but the low-grounds fully make up in interest for anything that the hills may lack. Heather is the characteristic plant of the whole area, and in this connection we come on the first of many remarkable points which make the West Irish flora of such deep interest. Among the commoner heaths which cover the country with a brown carpet our eye falls on other quite unfamiliar species. No fewer

than three strange heaths occur in the district, often growing in great abundance; and none of them is found anywhere else in the British Islands. These are St. Dabeoc's Heath (*Dabeocia polifolia*), the Mediterranean Heath (*Erica mediterranea*) (fig. 106), and Mackay's Heath (*E. Mackaii*). A special significance attaches to these plants, inasmuch as they are absent from the whole of the northern portion of the Continent, and do not reappear till we get as far south as the Pyrenees. Nor are these the only Connemara plants which have elsewhere an entirely south-western range in Europe. For instance, on every rock in Connemara, up to the tops of the highest hills, nestle the close rosettes of the well-known London Pride (*Saxifraga umbrosa*); we may find this plant all along the West Coast of Ireland, but elsewhere, as a native, only in the Pyrenean region. Examining the flora more closely we discover another stranger, this time a water plant—a little plant with a tuft of grassy, submerged leaves and an erect stem bearing a button-like head of greyish flowers. This little hydrophyte constitutes a very great puzzle, for it proves to be the Pipewort (*Eriocaulon septangulare*) (fig. 107), a North American species unknown on the Continent of Europe. It ranges up and down the West of Ireland, and reappears sparingly in the western isles of Scotland; elsewhere it is confined exclusively to the northern United States and Canada. For the present we must only bear in mind the very remarkable distribution of this plant; its significance will appear later. Plenty of other interesting plants await us in Connemara, but with these few examples of its most remarkable species we must pass on to another scene.

In the grand county of Kerry, the massive Devonian sandstones and slates form mountain-folds which run north-east and south-west, projecting far into the Atlantic in a series of noble promontories before they sink below the level of the ocean. The deep valleys between are often paved with the last fragments of the limestones that once arched over these great ridges, and their lower parts are filled with long fiord-like sea inlets. This, again, is a heathery country save on the limestone, where grass prevails; and the great ribs of rock give shelter and allow of the growth of a considerable amount of native timber. In these woods, especially in the more inaccessible spots, among the Birch, Oak, Ash, Holly, and Yew that flourish there, we are surprised to meet with great trees of *Arbutus Unedo* (fig. 108), with their handsome red trunks and evergreen foliage; and it comes upon us in a flash that here is again an instance, as in Connemara, of a far southern plant inhabiting western Ireland, for the *Arbutus* is a member of the Mediterranean flora, growing in Spain, Italy, Greece, but not in the more northern parts of the Continent. Seeking for further evidence, we find among the rocks abundance not only of the now familiar London Pride, but also of its ally, the Kidney-leaved Saxifrage (*Saxifraga Geum*), elsewhere (save for a single newly discovered station in Mayo) exclusively a plant of the Pyrenean region. The undergrowth of the woods, too, is full of a handsome species of Spurge, which we identify as *Euphorbia hiberna*. This plant has its headquarters in south-west

Ireland, reappearing occasionally along the west coast as far north as Donegal; it is also met with in the south-west of England, but we do not meet it again till we approach the Mediterranean. Another Kerry plant with a similar distribution (south-west Ireland, south-west England, and south-west Europe) is the little *Sibthorpia europaea*. Again, the hills around are glorious in May with the great purple blooms of the large-flowered Butterwort (*Pinguicula grandiflora*). This plant is southern, but not lowland, in its continental range, occurring on the Pyrenees and on the Alps. And, as in Connemara, we find associated with these southern species northern plants like the American Pipewort, and (in the adjoining county of Cork) the interesting American orchid *Spiranthes Romanzoffiana*, unknown in Europe outside of Ireland. The occurrence of the last-named plant is of very great interest, for it goes far to reinforce the suggestion supplied by the Pipewort, of an American element in the West Irish flora. A third species also comes in to join these two. Along the stream banks and in other wild situations we find in abundance the pretty little blue starry flowers and grassy leaves of the "Blue-eyed Grass" of Canada (*Sisyrinchium angustifolium*), another typical American plant, which is widely spread along the West Coast of Ireland.

Turning northward now we must pay a brief visit to the strange district of Burren in county Clare, to which I referred in my lecture last year. This differs from Connemara and Kerry in being a limestone area. Instead of rugged heathery mountains formed of folded and crumpled slates or sandstones or quartzites, Burren presents a group of broad, undulating hills formed of horizontal beds of limestone. But its remarkable feature is that these hills are entirely bare of any covering of clay or soil. The glaciers that smoothed over their slopes passed away without leaving any blanket of drift. Percolating water sinking into the vertical joints of the bare rock has dissolved out innumerable drainage passages, by which any insoluble detritus has been carried off; and the grey rock, all water-carved and weather-worn, lies bare and naked, rising terrace upon terrace, or broken up into wildernesses of angular blocks of stone. Vegetable soil has slowly formed in innumerable crevices and pockets, and the vegetation, spreading outwards from every little centre, has covered up with a green carpet a good deal of the naked rock. But the aspect of the hills is still that of a waterless grey desert, and it is surprising to discover the wealth of rare plants tucked away in the crevices, just as it is surprising to find that this land of rock has quite a high value for sheep-grazing. The moist, warm climate is no doubt the chief contributory cause in both cases. Here on these hills, equally at sea-level and a thousand feet above it, we are struck at once with the abundance and luxuriance of several plants which we are accustomed to consider alpine species. The Mountain Avens (*Dryas octopetala*) is present in sheets, the most abundant plant over many square miles, its blossoms whitening the ground as far as the eye can reach, like daisies in pasture-land. A little earlier in the season an equally large

area is decked with the vivid blue flowers of the Spring Gentian (*Gentiana verna*), abounding alike on the coastal sand dunes and on the hill-tops. The Bearberry (*Arctostaphylos Uva-ursi*, too, trails over every rock, with the Dwarf Juniper (*Juniperus nana*), the Vernal Sandwort (*Arenaria verna*), the rare little *Euphrasia salisburgensis*, and *Saxifraga Sternbergii* (fig. 109). And in striking contrast with these hardy alpine-loving species we find mixed with them tender plants of the south, which here grow further northward than in any other country. The deep cracks in the limestone pavements, and also in vertical rocks, are filled with the Maidenhair (*Adiantum Capillus-Veneris*), growing in great luxuriance; and still more suggestive of southern climes is a little orchid (*Neotinea intacta*), which flowers in May among the Mountain Avens and Spring Gentian; it is found nowhere in the British Isles save in the west of Ireland, and elsewhere it is exclusively a plant of the sunny shores of the Mediterranean. Among this remarkable assemblage of northern and southern forms other striking plants grow in very unusual profusion, helping to emphasize the peculiar character of the flora—the Bloody Crane's-bill (*Geranium sanguineum*), the Wild Madder (*Rubia peregrina*), the Squinancy-wort (*Asperula cynanchica*), Blue Moor-grass (*Sesleria caerulea*), Stone Bramble (*Rubus saxatilis*), and more locally the rare Hoary Rock-rose (*Helianthemum vineale*), Shrubby Cinquefoil (*Potentilla fruticosa*), and other interesting species, all set in an extraordinary profusion of Scale Fern and Hart's-tongue. These grey hills of stone, which at a short distance seem a mere desert, prove on closer acquaintance a veritable botanical paradise.

Let us take one more West of Ireland scene—another limestone district, lying a hundred miles north of the last, in the counties of Sligo and Leitrim. Here, as in Clare, the grey rock still reposes undisturbed in horizontal sheets, as originally laid down, though now raised up to nearly 2000 feet above sea-level. But in this district the Ice Age has not ground down the limestones into undulating hills. Instead, the weather, attacking the strong, vertical cracks or joints with which the rock is traversed, has by degrees eaten into the edges of the mass, and carved deep valleys across it, so that there now remains a lofty table-land, fringed with great grey cliff-walls and traversed by deep fertile vales, over which on each side the lofty limestone precipices stand imminent. The fertile boulder-clay which fills the valleys and covers the plain which surrounds the hill-masses, yields pleasant farm-land, with trees and green fields; the plateau itself, which still bears fragments of the newer sandy and shaley rocks that once covered the limestone, is densely clothed with shaggy brown bog; and it is on the grey cliff-walls themselves that the botanist finds his harvest. Here, on Ben Bulben and its neighbours, is gathered together a very interesting assemblage of plants, mostly alpine in their general distribution. Conspicuous among them is a little Sandwort (*Arenaria ciliata*), a tiny plant forming green mats smothered in white blossoms, which is not found elsewhere in the British Islands. With it grow masses of *Silene acaulis*, *Draba incana*, *Dryas octopetala*, *Saxifraga aizoides*, *S. hypnoides*,

FIG. 103.—ARBUTUS UNEDO, ON SHORE OF UPPER LAKE, KILLARNEY. *Photo: R. Welch.*

(*To face page* 304.)

Photo: R. Welch.

Fig. 102.—*Sphenophyllum Sternbergii*. Typical habitat. Black Head, Co. Clare.

S. oppositifolia, *Euphrasia salisburgensis*, *Oxyria digyna*, *Sesleria caerulea*, *Asplenium viride*; while among the rarer concomitants are *Saxifraga nivalis*, *Epilobium alsinefolium*, *Polygala grandiflora*, *Poa alpina*, *Aspidium Lonchitis*, and many other interesting species. These all grow on the terraced limestone cliffs and on the steep taluses which subtend them, mostly at an elevation of about 1000 feet, and they form a delightful study for the botanist. In this district we again find evidence of that peculiar mixing of northern and southern types, and of that seeming indifference to questions of elevation which we have found to be so characteristic of Western Ireland. On the cliffs the Maidenhair joins the various alpine species at an elevation of 700 feet, and close by, at Rosses Point, the same fern grows on sea-rocks, accompanied by *Saxifraga aizoides*, *Draba incana*, *Sesleria caerulea*, and *Juniperus nana*.

We have seen, then, that the especial features of the West of Ireland flora consist, first, in the reduction of the number of species, as compared with more eastern tracts, leading to the absence of many familiar wild flowers; secondly, in the presence of a small number of rare species not found in the greater portion of the British Islands; and, thirdly, in the mixing together at various elevations of what we have been accustomed to consider high-level and low-level plants. The cause of the first of these phenomena has been already suggested. As regards the third, the actual climatic and edaphic conditions which plants require are so complicated, and as yet so little known, that it is futile to throw out suggestions here. But as regards the second, I would like to emphasize the lessons which it teaches. These Mediterranean, Pyrenean, and North American species are, without doubt, strictly *native* in their Irish home. No theory as to their being early human introductions, though often put forward by the unlearned, will for a moment pass muster with the botanist who has studied the question, though it would be out of place here to detail his arguments. Furthermore, the distribution of these species suggests that they belong to a very old section of our flora. They have, as a whole, no peculiar adaptations which would allow them to negotiate successfully a journey in or over the sea; their seeds are less suited to either air- or water-carriage than those of hundreds of other Spanish or Mediterranean species which have not found their way to any part of our islands. Again, the entire absence of the southern plants from the middle parts of Ireland, England, and France tells against the theory that they came from their southern homes by the route that would be now, with the present distribution of land and sea, the most likely one. On the contrary, the reappearance of some of the Irish-Pyrenean plants in the extreme south-west of England, and the occurrence there of several plants of similar type which do not extend to Ireland, such as *Erica ciliaris* and *E. stricta*, strongly support the view that we have here the relics of a vegetation which was once spread along a bygone European coast-line which stretched unbroken from Ireland to Spain.

As to the American plants, the question is still more difficult, but the

further we study it the more we shall be inclined to arrive at a similar conclusion, and to account for the existence of these species in Ireland—and one of the most characteristic of them, the Pipewort, in western Scotland also—by the assumption of their migration across an ancient land surface which once extended across the North Atlantic, *via* Iceland and Greenland.

Our study of the West of Ireland flora has led us far afield indeed. Behind these modest, unfamiliar wild-flowers, which one meets on the Connaught roadside, loom problems which take us back through tens of thousands of years, and which involve vast changes in the distribution of land and sea. Indeed, as we have seen, to understand the conditions which have determined the presence or absence of species in the district we have been considering, we have to look back to a period almost infinitely remote—back through the Tertiary and Secondary periods of the geologist to those primeval times when the only vertebrate inhabitants of our globe were the armour-plated fishes of Silurian seas.

SURVIVALS AMONG PLANTS OF THE PAST.

By Rev. Professor G. Henslow, M.A., V.M.H., &c.

[Read June 7, 1910.]

Evolution as popularly understood is supposed to imply a gradual improvement in the structures of animals and plants, as developed through the past ages of the world, until the most perfect type of all, Man, closed the series. This is true in a sense, but it must be borne in mind that each and every kind was, and is, as perfectly adapted to its position in life as it requires to be. The advancement is perhaps best seen in the fact that the *adult* forms of the earlier ages corresponded with the young or *embryonic* stages of later and existing types of the same groups. Thus the "tadpole and newt" stage of the *Amphibia* were the highest attained in the period when coal plants grew; the frog type is of a much later origin.

But each group had its day and then died out; so that, as a rule, it is only organisms of the latest geological eras that still exist. Yet a certain number of types of several ancient groups are *represented* at the present day, if not by identically the same species, by some more or less closely allied specific forms of the same genus; or it may be that a different genus now stands for its ancient and extinct forebears.

Thus, one of the oldest shells known, the impressions of which are found on slates near the top of Cader Idris, in Wales, was apparently just like the *Lingula* of to-day. The *Nautilus*, or type genus of the great family *Nautilidae*, which succeeded the *Lingula* in a subsequent period, is the sole generic survival; while the vast number of *Ammonites*, which were evolved out of the *Nautilidae*, are gone for ever.

Similarly among plants survivals are still with us, and I purpose selecting some of the more interesting and better-known examples out of the great groups or classes of plants known as the higher Cryptogams, Gymnosperms, and Angiosperms, which last include Dicotyledons and Monocotyledons.

As far as is known, only the first two have been found in the earliest or Primary strata, which ended with the Coal period, and in a stratum which covered them (Permian). The Secondary epoch ends with the Chalk. In the Secondary strata are found types which more resemble those of living forms. The Tertiary epoch begins with the *Eocene* strata—*i.e.* "Dawn of the New" periods. In these we begin to feel at home among the later fossil floras, especially in the next stratum or *Miocene*.

Turning to living groups of the higher and woody-stemmed Cryptogams, those more or less represented among coal plants are the Horse-

tails or *Equisetum*, the sole surviving genus of the natural order, or family, *Equisetaceae*, its ancestors having been very numerous ages ago.

The *Lycopodiaceae*, having five existing genera (*Lycopodium*, the humble club-moss, and *Selaginella* being familiar to all), were represented by gigantic trees, 100 feet tall, but only of the *Selaginella* type: the ancestry of the club-mosses is at present unknown. Ferns or *Filices* now exist by thousands, but impressions looking exactly like, and formerly thought to be, ferns are now known to be of a higher nature. The most ancient tribes have but few living representatives, such as *Osmundaceae*, of which only the genera *Osmunda* (our "Royal Fern") and *Todea* exist. Another family, *Marattiaceae*, with four living genera, was also well represented in the Coal period. Such are survivals.

It may be laid down as a general rule that where a group has only one or very few living forms to represent it, this fact implies a long-lost ancestry; and that if it be found fossil, it usually had a very wide distribution, both past and present, over the globe, for some of the later orders and genera are in this condition to-day. Thus, our Sweet Gale (*Myrica Gale*) is found in North America, on the mountains of Asia, and extends as far as China and Japan; while several species of *Myrica* are living at the Cape of Good Hope. *Myrica* is also known as a fossil.

Another very general feature about fossil animals and plants is that the older types of any series are "generalized" in structure in that they show characters combined in one and the same genus, which become subsequently typical of distinct genera of a later period. Thus the names *Ichthyosaurus*, or "fish-lizard," and *Hyaenarctos*, "hyæna-bear," indicate this fact among animals.

So it is with plants; a very common form of impression on coal-shales is one of plants with wedge-shaped leaves having the veins repeatedly or "dichotomously" forking. Hence the name *Sphenophyllum*, "wedge-leaf." Now, this is allied to the horsetails as well as to *Psilotum* and *Tmesipteris*, two living genera of the Lycopods. Similarly what were formerly supposed to be ferns from the foliage are now found to have naked seeds, and are therefore gymnosperms.

Of our survivals among Cryptograms, the horsetail (*Equisetum*) is a conspicuous example. Though a solitary genus now, there were many allies in the Coal period; and the oldest known, *Archeocalamites*, more nearly resembles the living horsetails than later forms of the same group.

As with Lycopods, so with Ferns, the earliest kinds, as we have stated, are now represented by tribes having few genera left. Other tribes of Ferns with few genera, as *Schizaeaceae* (three) and *Gleicheniaceae* (four), are found fossil in the Secondary epoch.

With regard to *Marattiaceae*, the sporangia, unlike those of the more recent and abundant living forms, were not separate but coherent into oblong or circular button-like "synangia." Thus *Kaulfussia*, only

known in Far Eastern regions, closely resembles the fossil *Ptychocarpus*.

Between the spore-bearing Cryptogams and true seed plants or Gymnosperms were the fossil Pteridosperms—*i.e.* "Fern-seed plants," which combine the characters of both classes. These were plants resembling ferns in the foliage, and were therefore supposed to belong to that group, until the reproductive organs were found attached to the fronds. They, however, bore ovules and seeds resembling those of *Cycas*. The stamens, however, were nearly "peltate" and find resemblances in several existing genera, as *Zamia*, *Taxus*, *Araucaria*, &c., as well as the sporangia of horsetails.

We now come to the seed plants. The difference arose by the macrosporangia having only one instead of many macrospores, and that one forming an ovule, provided with one coat (the secundine) only. This was prolonged into a tubular or inverted funnel-shaped process, the broad base being called the pollen-chamber, as the pollen fell into it. The earliest kind of pollen-chamber was formed by the *nucellus* of the ovule itself, and this is still the case in *Cycas* and *Ginkgo*. The microsporangia, on the other hand, constituted the anther, the microspores becoming pollen-grains.

Gymnosperms, which arose in the Coal period, are now represented by three families only—*Cycadeae*, with nine genera, *Gnetaceae*, with three, and *Coniferae*, divided into six tribes and thirty-one genera. One tribe, *Taxeae*, has six genera, of which *Taxus*, the yew tree, and the *Ginkgo* of Japan are survivors from the distant past.

A very common feature of the earliest as well as of surviving genera is the presence of catkins, consisting of bracts closely arranged on an axis, with or without stamens or ovules in their axils, but in Angiosperms there are, of course, pistils. Such is the characteristic feature of many living trees, which are also presumably survivals, from the paucity of the genera in their families respectively, as is seen in the *Amentiferae—i.e.* "Catkin-bearers"—as well as in *Myrica* and *Casuarina*, sole existing representatives of their families, both of which are therefore doubtless primitive types.

Though it is customary to say that Gymnosperms have no carpels or pistils, authorities differ on this point, for the latest view regards a not infrequent presence of an imperfect integument outside the ovule, mostly free from it, as the pistil; but in all cases it remains open above, so that the ovule has to receive the pollen directly within the pollen-chamber. Whatever be the origin of the pollen-chamber, it occurs in all living Gymnosperms.

A characteristic feature of the fossil *Cordaianthus*, and several Gymnosperms still living, as well as of the *Amentiferae*, is to have the anther-cells borne singly, and not coherent in pairs, as usually prevails in stamens.

Perhaps this want of cohesion between the two pollen-sacs of the anther may have been a result of the primitive and prevailing feature of dichotomy of the ribs and veins in leaves, as seen in the frequently lobed

blade of *Ginkgo* and in the Sphenophyllums. Even in those of *Cordaites*, the ribs of which seem to be parallel, the veins are described both by Dr. Scott* and Miss Stopes† as dichotomous.

The ribs themselves probably branch from the base, though running subsequently parallel, just as in the phyllodes of *Lathyrus Nissolia*, *Oxalis bupleurifolia* and species of Australian *Acacia*.

These long "leaves" with parallel ribs of the Cordaites have been compared with those of Monocotyledons, but the intermediate venation is different. In the latter class the ribs are mostly joined by horizontal cross-bars at right angles, apparently to secure strength, for the blade is weakened by the influence of water; whereas in phyllodes of Dicotyledons the veins start at an acute angle, and when they are broad the veins become reticulated.

Hence, it seems probable that as the *Cordaites* are xerophytes, the supposed leaves may be really phyllodes, like those of *Acacia*. The vertical, instead of horizontal, position of the latter is probably due to the necessity of avoiding injury from the loss of heat by radiation.‡

We will now leave the primary and secondary epochs and come down to the Miocene of the Tertiary epoch, of which fossil plants have been found in various parts of the northern regions of the globe.

At Oeningen, in North Switzerland, 465 species are known, of which 166 are trees and shrubs, including many living American genera, as *Sequoia* (the "Big-tree," or *Wellingtonia* of California), Oaks, *Liriodendron* (the Tulip tree), Maple, Plane, &c. At Mull and Bovey Tracey in Devonshire, *Sequoia* also occurs.

On the West Coast of Greenland (70° N. Lat.) a fossil flora exists, including the Walnut, Vine, Magnolia, &c. Even at Grinnell Land (80° N. Lat.) off the West Coast of Greenland, are the Norway Spruce, the deciduous cypress (*Taxodium*) and *Sequoia*. Another site is Colorado. Now, omitting the more Arctic districts, all these sites of the fossil Miocene, viz., Colorado, British Isles, and Oeningen, lie between 30° and 60° N. Lat., while the existing floras characterized by having descendants of the Miocene, viz., East Coast of North America and Japan, lie between 20° and 40° N. Lat.

The question arises, how did they get to these two far distant countries? There are about 100 genera common to both; seventy-seven genera are also common to the Swiss Miocene, of which twenty-six are not now living in Europe. Iceland and Greenland have them as well.

It appears, then, that in the early Miocene period, or perhaps in the latter part of the preceding Eocene, or the intermediate "Oligocene," times, the Arctic regions were favoured with a temperature now prevailing in the warmer temperate zone, and as the cold drew on they were driven southwards, where land was continuous, till they settled along the 40th parallel of latitude. Obstructions, such as the mountains

* *New Phytologist*, vol. ii. p. 92.

† "A Theoretical Origin of Endogens," *Journ. Lin. Soc. Bot.* xxix. p. 485.

‡ I have elsewhere suggested that the long parallel veined "leaves" of Monocotyledon are all really phyllodes, the blades being restored in *Sagittaria*, *Tamus*, &c. *Loc. cit.* p. 517.

of North-West America and Scandinavia, and of the sea on the South of Greenland, prevented a continuous Miocene flora to be formed all round the world, Japan and East-North America being now the two most characteristic areas containing the survivals of this Miocene flora. The following are a few well-known types common to both: *Magnolia*, *Nelumbium*, *Ampelopsis*, *Aesculus*, *Wistaria*, *Cassia*, *Hydrangea*, *Diervilla*, *Catalpa*, *Phlox*, *Musa*, *Taxodium*, *Rhus*, *Juglans*, &c.

The Southern Hemisphere is as equally characterized by survivals as the Northern. Studying the floras of South America, South Africa, and Australasia, many genera are found to be common to two or all three of the Southern Continents. Perhaps the family *Proteaceae* is one of the widest in distribution. It is in all three of the districts mentioned, as well as in India and the South Pacific Islands, and is found *fossil* in Switzerland and North America. Of familiar genera, *Fuchsia* and *Calceolaria* have their home in South America, but two species of each reappear in New Zealand.

Myrica (including our Sweet Gale) is found in North America, Europe, Asia, West China, and Japan, and has several species at the Cape. *Geum* occurs in all three Southern Continents.

To explain these occurrences, we find the 2000-fathom line unites all three continents by submarine "peninsulas," if one may so express it, the 3000-fathom line forming intermediate "bays," indicating the fact of a large antarctic continent formerly connecting these southern and now widely separated lands; so that at the present day there are some forty-eight species or representatives common to Australasia and South America, and forty-nine genera are represented by closely allied species. A few well known may be mentioned: *Drosera*, *Lobelia*, *Oxalis*, *Gunnera*, and *Lomaria*. The Cape is similarly connected with Australasia by *Pelargonium* and *Restiaceae*, &c., while the 500 species of Heath (*Erica*) are also represented in Australia by the allied order *Epacridaceae*, none of these being in common with South America.

FIFTY YEARS AMONG PANSIES AND VIOLAS.

By James Grieve, F.R.H.S.

[Read June 21, 1910.]

It was in 1854 that I began my gardening career, and from the beginning I took an interest in the Pansy. In those far-back days the English Show Pansy was the only type grown, and I can well remember the noted English growers of that day—Charles Turner and W. Bragg of Slough, William Dean of Shipley, and Henry Hooper of Bath. Scotch growers were also turning their attention in earnest to Pansies at that time. Mr. John Downie had a few years previously resigned his situation as gardener at Southbank Park, Edinburgh, and had, with Mr. Laird, established the firm of Downie & Laird. Mr. John Laing was still gardener at Dysart House. Messrs. Dicksons & Co., even then an old firm, Handyside of Musselburgh, Lightbody of Falkirk, White & Sinclair of Paisley, Syme & Middlemass of Glasgow, were all trade growers of Pansies. In the amateur classes of those days two men who were to become famous were competing against each other—Dr. Stuart and James Dobbie.

Among the dark self varieties in vogue were 'Duke of Perth' and 'St. Andrews.' White selfs were a poor lot, and yellow selfs not much better. 'Cherub,' a yellow self sent out about 1860 by Hooper, of Bath, was the first really good yellow self that appeared. There were then no cream or blue selfs. Our great aim was to get flowers with solid blotches and distinct markings, with an eye in the centre of the flower.

After five years' experience in private establishments I entered the service of Messrs. Dicksons & Co., Edinburgh, in 1859. In February 1860 Messrs. Dicksons' Pansy-grower, Daniel Hafferman, an Irishman, left them to become nursery-manager to Messrs. Imrie, Ayr, and I was promoted to take charge of the Pansies, and continued to do so for the next thirty-six years—*i.e.* till 1895. In 1860 all the best Pansies were grown in pots, mostly 8 inch, plunged in ashes in cold frames. Great pains were taken to secure the best loam, which was mixed with old cow manure. Artificials were almost unknown then, and I often think it would be better if they were unknown still. It would be better, I am sure, for the constitution not only of our Pansies but of our Potatos. I was the first to introduce the practice of planting Pansies out in cold frames to obtain exhibition blooms, and this plan is now universally followed.

The Show Pansy continued to be the leading type of Pansy up till about 1870, great improvements in its form, substance, and markings being made. The Fancy Pansy made its appearance in Scotland about

'John Cunningham.'

'Bethea.'

'Duchess of Fife.'

'Redbraes White.'

'Dr. McFarlane.'

'Blue Cloud.'

'Lizzie Storer.'

'Councillor Watters.'

FIG. 110.—VARIETIES OF VIOLAS.

(*To face page* 312.)

1861, when it was grown by Downie, Laird, & Laing. I well remember the first two varieties—'Dandie Dinmont' and 'Du Hamil.' Messrs. Downie, Laird, & Laing showed them in the Experimental Gardens, Edinburgh, at the Show of the Royal Caledonian Society. I remember them so well because they were shown in rows of six blooms, one variety alternating with the other. Many strange and forcible phrases were used to condemn the newcomers by the old florists, but their novel and gaudy colours and greater size of bloom wrought gradually into the favour of at least the ladies, with the usual result that the men had to follow suit.

From a roughness almost like that of a Scotch terrier, the Fancy Pansy was licked into shape, and by 1880 had almost eclipsed the Show Pansy and become a universal favourite.

The Fancy Pansies were bred entirely from the continental introductions. They were never crossed with the Show Pansy. That would have made confusion worse confounded. The method adopted in raising new varieties was simply to take seed from the best-formed and gayest-coloured.

From the very beginning of my career I have been specially attracted to the Viola, and began by crossing, when I was very young, all the species I could obtain, including *Viola lutea* from the Pentland Hills, *V. cornuta* from the Pyrenees, *V. stricta* from India, obtained through Miss Hope of Wardie, and *V. amoena* from Moffat. I started to cross-fertilize all these with pollen of the Show Pansy, and the results were highly satisfactory. I never got any good results with the reverse cross. In these days there was a battle between the so-called Bedding Pansies and the Violas (I use the word Viola here in its modern application) and it is still going on. My friend Mr. Cuthbertson may have something to say on this. To illustrate the state of matters, forty years ago we had Bedding Pansies (which were simply Show Pansies with good bedding habits), such as 'Blue King,' 'Lilacina,' 'Holyrood,' 'Tory,' and 'Regina' (white), and 'Henderson's Golden Bedder,' and Violas, such as 'Golden Gem,' 'Alpha,' and 'Grievei.' The march of development, so far as varieties raised by me is concerned, is represented by 'Sovereign,' 'Pilrig Park,' 'Scotia,' 'Acme,' 'Royalty,' 'Edina,' 'Formosa,' 'Virginalis,' 'Bullion,' 'Dawn of Day,' 'Merchiston Castle,' and I consider I reached the high-water mark recently with 'Redbraes Yellow' and 'Redbraes White,' 'Royal Scot' and 'Redbraes Bronze.'

In the beginning, as I have already said, my varieties were all obtained by crossing the wild types with pollen from Show Pansies. For example, *V. cornuta* × 'Dux' Show Pansy gave 'Vanguard' (purple); *V. stricta* (improved) × 'Sovereign' gave 'Ariel' and 'Bullion'; *V. cornuta* improved (named 'Perfection') × 'Sunray' Fancy Pansy gave 'Lilacina'; *V. cornuta* ('Perfection') × 'Dux' Show Pansy gave 'Tory.'

All my recent varieties have been raised without the aid of cross-fertilization. I have simply saved seed from the best varieties existing

in their respective classes, selected those which I considered improvements in colour or habit, and tried them for several years.

Contemporaries with my early work were few, as the Viola was scoffed at by many traders. I well remember my first exhibit of Violas in London. It was in 1870 at the Crystal Palace. I staged for Messrs. Dicksons forty-eight varieties in bunches of Bedding Violas and Pansies, and instead of booking orders I had to stand the scoffs and jeers of many, including George Glenny, who gave me a terrible dressing for bringing such weeds such a distance. But I was not discouraged; in fact, I rather enjoyed the castigation, and went home determined to persevere and work out my ideas of what was wanted as a bedding plant, with the result that when the boom came we were ready for it, and Messrs. Dicksons reaped a rich reward, for many seasons selling a very large stock completely out at 25*s*. per 100 for general varieties, and for all new varieties we obtained 2*s*. 6*d*. each, and in many seasons could not meet the demand. In these days (1870 to 1885) all the Violas were grown in thumb pots. The cuttings were put in in September in frames, and when rooted, potted up into small pots, being sent out in this way in spring.

In Scotland Messrs. Dicksons had no serious rivals in the raising and introduction of Violas until Messrs. Dobbie took up their cultivation about 1890, although good work had been done in the way of raising by Dr. Stuart and Mr. John Baxter.

PANSIES AND VIOLAS.

By William Cuthbertson, J.P., F.R.H.S.

[Read June 21, 1910.]

When I was honoured last summer by being asked to lecture on "Pansies" I at once thought it would add interest to such a lecture if I could get associated with me Mr. James Grieve. Mr. Grieve readily consented, and his interesting contribution precedes this. My only regret is that you are not able to hear him deliver it himself, as you would greatly enjoy his virile personality. It would come like a breeze from his native hills.

It is now over thirty years since I joined the firm of Dobbie & Co. Mr. James Dobbie was then in full vigour, and was noted, among other things, for Pansies. I remember several times trying to induce him to grow Violas, but he would have none of them. They are only "bad Pansies" was his oft-repeated remark; "leave them to Grieve and Baxter." In that you see the old florists' condition of mind. To them form or outline and clear, distinct markings were everything. I know it has become the fashion to despise the doings of the old florists and even to cast ridicule on them; but to those who, like myself, were trained in their school, and who knew them personally, the only feelings we shall ever cherish towards them will be those of admiration and respect. Let me give one example: You must all have heard of the devotion of the old Scotch hand-loom weavers to their flowers. In the Paisley and Kilbarchan districts such weaver-florists were legion, and one of their first favourites was the laced Pink. I can remember one of the best among them—John Love—old John Love, as we used to call him —telling me he wanted nothing to make him happy if he could only have a few square yards of ground on which to grow his loved Pinks to the end—"till the call came," as he himself phrased it. We do not often see devotion like that now to the simpler flowers such as Pinks, Pansies, and Sweet Williams, but such men did their share of the world's floral work, and did it well.

From 1860 to 1880 the old English or Show Pansy (fig. 111) was gradually being perfected, and the fine varieties then in existence have not since been surpassed. I can remember the best among dark selfs in 1880 were 'Beacon,' 'Robert Black,' 'The Shah.' The finest among yellow selfs, 'Captain Hayter,' 'Golden Lion,' 'Yellow King.' The finest white selfs, 'Alpha,' 'Mrs. Dobbie,' 'Janey Anderson.' The finest yellow grounds, 'David Christie,' 'Defoe,' 'Robert Burns.' The finest white grounds, 'Blue Gown,' 'Jane Grieve,' 'Village Maid.' Fortunately, we are able to see representatives of these classes at the present time, as they are still grown.

But even thirty years ago the Show Pansy was being hard pressed by the Fancy or Belgian Pansy (fig. 112), which is so well known to all present. I do not know whether it is because I have a hankering after old things or not, but I think the Fancy Pansies of the "eighties," 'May Tate,' 'Evelyn Bruce,' 'Kenneth Brodie,' 'Miss Bliss,' 'Mrs. Jamieson,' 'Mrs. John Downie,' 'Catherine Agnes,' 'David Rennie,' 'Mrs. E. H. Wood,' 'Wm. Cuthbertson,' and others were as fine and distinct in their markings as any we have to-day. We have certainly

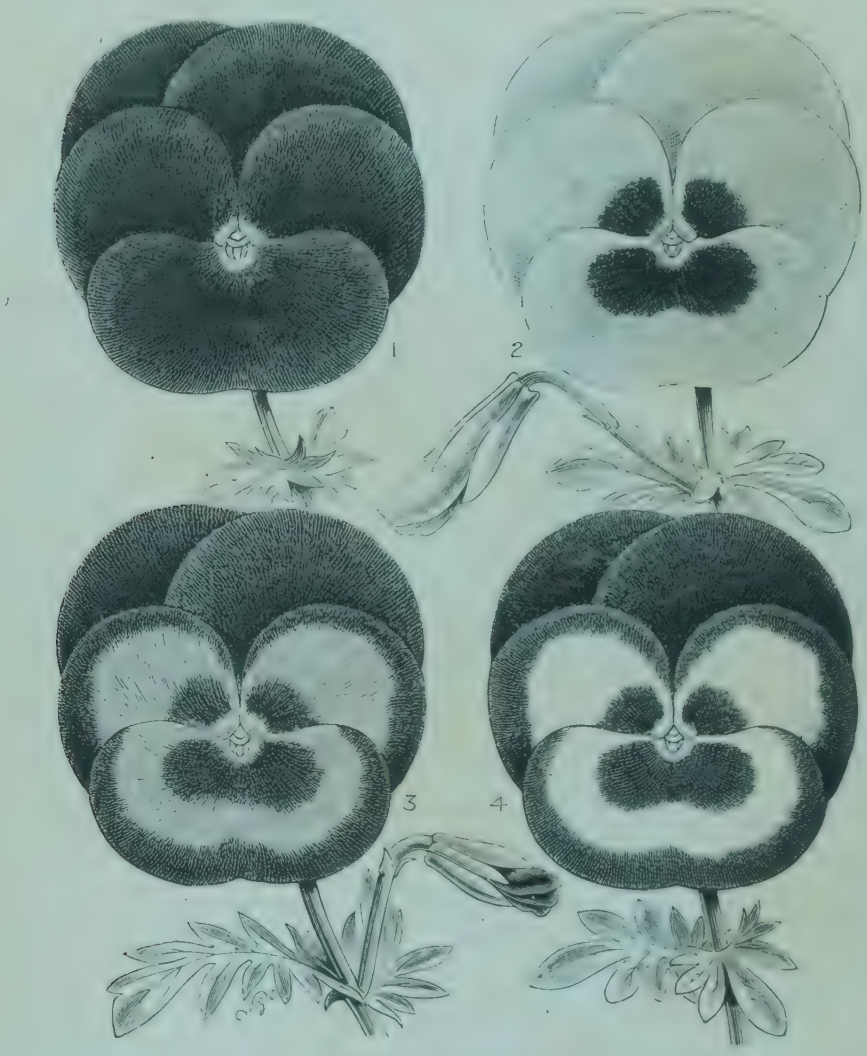

FIG. 111.—SHOW OR OLD ENGLISH PANSIES.
1, Dark self; 2, White self; 3, Yellow ground; 4, White ground.

increased the size, and I am sure we grow them better, but the quality is not better, or I am much mistaken.

Now what can I say this afternoon that will be helpful to those who would like to grow good Pansies (not Violas—of them I will speak later)? They can be grown in two ways, from cuttings or from seed. Let me speak first about growing named sorts. Speaking generally, they will not give satisfaction in dry, sunny situations. The wild types love the shelter of a hedge bank, and he who imitates Nature's conditions will succeed best. The morning or late afternoon sun will do good; the

FIG. 112.—VIOLA 'CHRISTIANA' AFTER STANDING THREE YEARS IN THE OPEN.
Note the yellow eye.

(*To face page* 316.)

Fig. 113.—Viola 'Snowflake'

full glare of the sun from eleven to three o'clock will make named Pansies unhappy. Select, then, a position in the garden where the plants will enjoy themselves, and you will be amply repaid. Prepare the ground in autumn by deep cultivation, enriching liberally with half-decomposed cowdung if it can be had. Fork over the surface in January or February. Take the plants from the cold frames in March with as much soil adhering to the roots as possible, and, with careful attention to watering and other details, splendid flowers will be had during most of the summer. To obtain fine strong plants for spring planting, cuttings should be inserted in cold frames in a shady position from July onwards to September, and named varieties should certainly be allowed to winter in frames.

Now about varieties. I think, if I give twelve or eighteen names of reliable varieties, that will be enough for those who are not exhibitors. 'Hugh Mitchell,' 'Archie Milloy,' 'Holroyd Paul,' 'Hall Robertson,' 'Mrs. R. P. Butler,' 'John Picken,' 'Mrs. A. Ireland,' 'Mrs. James Smith,' 'Mrs. H. Stewart,' 'Miss Neil,' 'Miss A. B. Douglas,' 'Margaret Fife' (fig. 114), 'Robert McCaughie,' 'Mrs. Campbell' (yellow), 'Thos. Stevenson,' 'James McNab,' 'Neil McKay,' 'Rev. D. R. Williamson.' These are fine sorts and good growers.

The Raising of Pansies from Seed.—This is perhaps the best way of all for those who desire a good display, as seedlings are always hardier than plants from cuttings, and they may be planted out with safety in most places in autumn, thus ensuring a longer period of blooming. From May onwards seed may be sown according to the treatment it is intended to give the seedlings. If sowing is to be done out of doors or in a cold frame, I should recommend the end of May. If to be sown in boxes in a greenhouse and carefully looked after, a month later will be time enough. The great object to be aimed at is to obtain by the end of September fine strong, stubby plants with three or four shoots breaking at the base and well rooted. From the seed boxes or seed bed the plants ought to be transplanted once, say, in August. Results will depend much on the quality of the seed sown, and everyone should make sure of obtaining a high-grade article. Let me say that cheap Pansy seed cannot be good. It is exceedingly difficult to save Pansy seed in quantity in this country, and we are therefore dependent to a large extent on foreign seed. To give an idea of the range in quality, wholesale firms like Benary and Vilmorin quote Pansy seed as low as 1*s.* and as high as 50*s.* the ounce. Genuine home-saved seed from named varieties is always difficult to procure, but the highest grade of foreign seed will give excellent results.

Two years ago I saw several large beds of Pansies in the garden of Mr. Walsh, the schoolmaster of Birch, in Essex. I never saw stronger, healthier Pansy plants in my life. They were seedlings which Mr. Walsh told me he sowed in boxes placed under a north wall on June 27th the year previous, transplanted into a bed facing west early in August, and finally planted where they were to flower at the end of September. Before planting out several had thrown flowers, but these were picked

off, and I think this is one of the secrets of getting seedling plants like Pansies, Pentstemons, Antirrhinums, &c., to winter outside—to rigidly prevent them blooming. They then make every effort themselves to survive to carry out their life's work. Mr. Walsh had no loss at all during the winter. At Easter they were in full bloom, and such blooms—hundreds and hundreds—well over three inches in diameter—capital flowers, most of them. One frequently sees large-flowered, most brilliantly coloured Pansies for sale in London shops and in Covent Garden, but everyone who buys them, takes them home, and plants

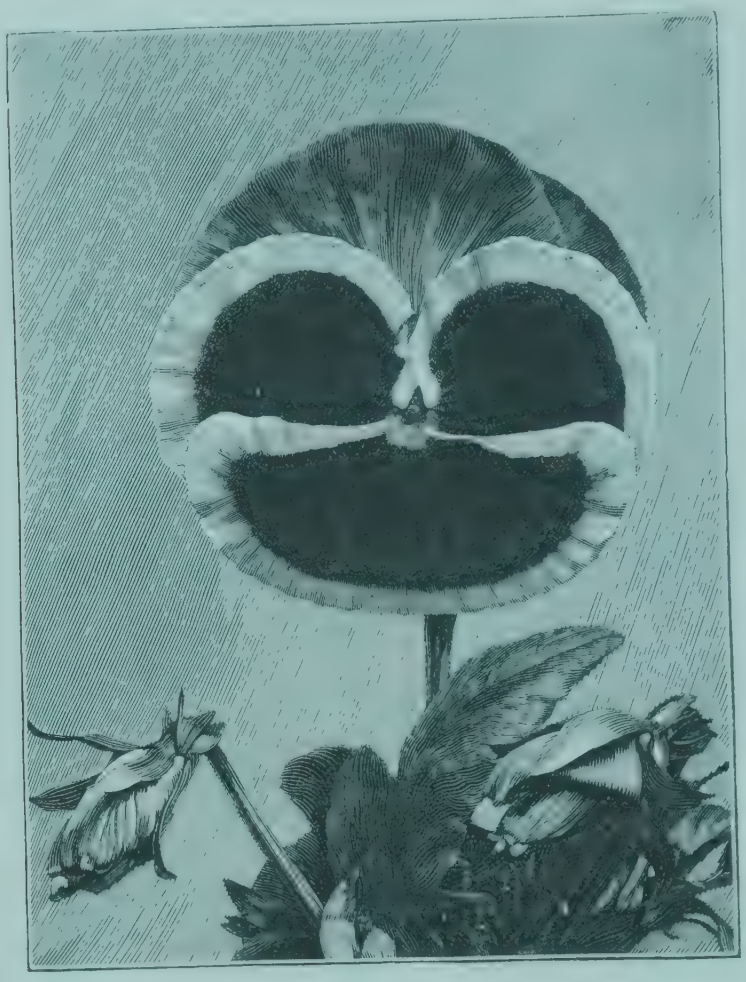

Fig. 114.—Fancy Pansy 'Margaret Fife.'

them, is disappointed. I know, because I have tried it several times. The reason is this: the plants are specially grown and specially fed to produce the blooms which make them sell, and this exertion, coupled with the attempt to transplant them when in a flush of growth, ends in disaster. Anyone imitating the procedure of the market grower under his conditions would get similar results, and the results would be continued if the plants were not moved and the old flowers picked off. The strains used are splendid ones, and the results of many years' selection. They resemble in many cases a part of the goodwill of a business, and are carefully treasured by their owners.

Coming to Violas (fig. 110), one of the gardening sensations of last century was the spring bedding at Cliveden carried out by Mr. John Fleming. Violas were largely used, and became known as Cliveden Yellow, Cliveden Purple, Cliveden White, and Cliveden Blue. They were most effective for the purpose for which they were used. They were, of course, much nearer to the wild types in habit of growth and form of flower than our modern Violas. The latter are the creations of a host of raisers, nearly all of whom I have known personally during the last thirty years. Here, to-day, I shall only name those who were the pioneers in the work—Grieve, of Dicksons & Co., Baxter of Daldowie, Dr. Stuart, Dr. Dickson of Hartree, the brothers William and Richard Dean, all of whom except Mr. Grieve are now gone. In the popularizing of Violas, or, as he persists in calling them, Tufted Pansies, no man has done better work than Mr. William Robinson. In the early days he persistently figured them in colours in "The Garden," and I have at home now pictures of 'Jackanapes,' 'Quaker Maid,' 'Duchess of Fife,' 'Hartree' and other old varieties. What impresses one in this connection is the persistency of some of the old Violas. I have before me a catalogue issued by Dicksons of Edinburgh in 1880, and I find in it 'Archibald Grant,' 'Canary,' 'Blue King,' 'Countess of Kintore,' 'Holyrood,' 'Grievei,' 'Lilacina,' 'Sovereign,' and 'The Tory,' all of which are still grown, and one or two of which have not yet been superseded. Advancing sixteen years, I find another interesting list in the official Report of the trial of Violas in Regent's Park, held under the auspices of the Third Viola Conference. In that list we find 'Marchioness,' 'Countess of Hopetoun,' 'Pencaitland,' and 'Snowflake' given among the best whites, and any list of the best whites prepared to-day must contain 'Snowflake' and 'Pencaitland'—though I believe the modern 'Snowflake' (fig. 113) is an improved form.

'Sylvia' is given among creams, and it is the best still. 'Sulphurea' is among the primroses, and none to-day possess a better habit. The yellows in 1886 have all been eclipsed except 'Bullion.' Other old names which appear and still survive are 'True Blue,' 'Archibald Grant,' 'Favourite,' 'Wm. Neil,' and 'J. B. Riding.'

I do not propose to deal with exhibition Violas. If I were addressing an audience in the industrial centres of the North or in Scotland, they would not thank me unless I told them which Violas produced the biggest blooms and made up into the best exhibition sprays. I am sure *you* desire to know which are the hardiest, the earliest to bloom, and the most floriferous.

Three years ago I started an experiment in Essex to discover which varieties possessed these merits. I collected from the leading growers all the varieties they recommended for autumn planting, and in October I planted them in an open field in Essex. Time will not allow me to go fully into the details of the trial—these will be found in a book written by me and recently published by Messrs. Jack. It must serve to tell you which have survived satisfactorily over the three

intervening winters without the slightest protection of any kind, and have grown into splendid clumps twelve to eighteen inches in diameter. I consider the survival satisfactory if 75 per cent. or more have lived. The following varieties have stood that test:—

Whites.—'Peace,' 'Seagull,' 'Pencaitland,' 'Christiana' (fig. 112) ('White Beauty' very late).

Cream.—'Sylvia.'

Yellows.—'Klondyke,' 'Grievei,' 'Mrs. E. A. Cade.'

Shades of Blue.—'Royal Scot,' 'Blue Duchess,' 'Lilacina,' 'Florizel,' 'Wm. Neil.'

Purple.—'Jubilee' ('Edina,' very late).

Fancy.—'Blue Cloud,' 'Mrs. Chichester.'

Fifty to seventy-five per cent. of some remarkably fine sorts have survived, and these include favourites such as 'Snowflake,' 'Redbraes Yellow,' 'Walter Welsh,' 'Wm. Lockwood,' 'Iliffe,' 'Primrose Dame,' 'Archbald Grant,' 'Mauve Queen,' 'Maggie Mott,' 'Blue Rock,' 'Lady Marjorie,' 'Bridal Morn,' 'Councillor Watters.'

So much for our experience in Essex. In the North, at Edinburgh, Mr. McHattie, the well-known Superintendent of the City Gardens, finds the following most satisfactory: 'Blue Bell,' 'Royal Scot,' 'Saughton Blue,' 'Maggie Mott,' 'Bullion,' 'Redbraes Yellow, 'Alexandra' (white).

I can testify to the marvellously fine effect Mr. McHattie obtains with his new blue planted in conjunction with whites and yellows, and allowed to stand for two or three years. 'Saughton Blue' I should not term a Viola, because it has, like 'Lilacina,' a blotch on the under petal. Mr. Grieve said the battle between Violas and Bedding Pansies was still going on and I might have something to say about it. All I have to say is, that in catalogues varieties which are rayed, rayless, or blotched should be stated as such. For some reason or other the blotched varieties are hardiest.

Here I might say a word about a class of Violas called 'Violetta' or 'Miniature.' Its origin was a variety named 'Violetta,' raised by Dr. Stuart of Chirnside. The habit is remarkably close and compact and almost truly perennial in character. The blossoms are small and sweetly scented. For edgings and rockwork they are most valuable. In "The Garden" of June 1910 there is a beautiful coloured plate of Violettas, most of which have been raised by Mr. D. B. Crane of Highgate—one of the best friends the Viola has in the South.

I regret that the Royal Horticultural Society has not recently held a trial of Violas, but I can quite well understand that the soil conditions at Wisley are unsuitable. Much, however, may be done to make very light soils suitable if the ground be cultivated in August and thoroughly enriched with a very heavy dressing of cow manure and the plants put out in October.

At Chiswick in the old days very fine trials were held, and time has proved that the majority of the awards then made were right.

In conclusion I think it would be better to anticipate a question

which I have been asked hundreds of times, What is the difference between Pansies and Violas?

Pansies being largely bred from *V. tricolor*, an annual, are less perennial in their character than Violas, which, as you have heard from Mr. Grieve, were raised from true perennial species on the maternal side. But nowadays the distinction is an arbitrary one of florists. Generally speaking, Violas have no solid markings like the blotches of Pansies, and are best fitted on account of habit and purity of colour for all kinds of bedding work.

VIOLAS AT WISLEY, 1904-1910.

The following list shows in descending order the behaviour of a number of varieties of Violas at Wisley, where they were first planted for trial purposes in 1904 (see Journal R.H.S., vol. xxxi. (1906), pp. 240-244). The plants have been grown continuously, without watering in the summer and without protection in the winter.

Group 1.—Have grown and flowered well every year.

Violetta.
Kate Hay.
Ardwell Gem.
Archibald Grant.
Klondyke.
Blue Bell.
Dobbie's Blue Bedder.

Group 2.—Succeeded not quite so well.

Lucy Franklin.
Flower of Spring.
Primrose Dame.
Blue Cloud.
Amy Barr.
Maggie Mott.
Eldorado.
Blue Duchess.

Group 3.—Succeeded fairly well.

White Empress.
Formidable.
Jennie.
Lord Elcho.
Lizzie Paul.
White Duchess.
Duchess of Fife.

Group 4.—Grew and flowered rather poorly.

Nellie.
Royal Sovereign.
Mrs. C. F. Gordon.
Edina (1906-1910).
Miss Robertson.
Charles Jordan.
Blue Boy.
Admiral of the Blues.

Group. 5.—Grew and flowered poorly.

Mrs. J. W. McCrae.
Mary Robertson.
Mrs. James Lindsey.
Lark.
Robin.
Symphony.
J. C. Erskine.
Ada Fuller.
Saturn.
Mrs. Brousson.
Bessie Clarke.
Councillor Watters.
Jennie McCall.

TWO INSECTS AFFECTING WHEAT AND BARLEY CROPS.

By Fred Enock, F.L.S.

[Read July 19, 1910.]

It will be better probably to confine my remarks to one or two of the worst of the insects attacking wheat which have made their appearance in Great Britain, than to attempt to deal with all that are known, for their name is legion.

It will be within the recollection of many that in the year 1886 the "Hessian Fly," which in the United States of America does an enormous amount of damage, amounting to hundreds of thousands of pounds per annum, was discovered by Mr. George Palmer, of Revells Hall, Hertford, who found it doing considerable damage to the barley. Few entomologists were acquainted with the appearance or life-history of the pest at that time, and it was practically unknown to those who were officially connected with agriculture. Indeed, though twenty-four years have passed since then, much ignorance still prevails concerning it, even among those whose business it should be to make themselves acquainted with the pests of our crops.

I have been frequently asked "What is the 'Hessian Fly' like?" "How does it affect the wheat?" &c. I think the best reply to these questions will be to describe the entire life-history as I worked it out in the fields at Revells Hall, where Mr. Palmer first discovered it, and to whom I am greatly indebted not only for facilities for making observations of its habits, but also for supplying me with screenings during three seasons, so enabling me to confirm its life-history, which, though the Hessian Fly had been known in America for nearly a hundred years, had never been worked out. I was also able to disprove satisfactorily Wagner's statement that the Hessian Fly could *not* have been introduced into the United States in the straw mattresses of the Hessian troops, as the time taken in travelling from Hesse-Cassel to Long Island—four months—would be too long for the larvæ to survive.

On March 9, 1889, I received from Mr. Palmer a small bag of screenings of the harvest of 1887. On examination of these I picked out over one hundred puparia, all apparently dead; but, on carefully opening some, I found the contained maggot to be just alive—and only just. These I placed on damp soil, the moisture from which revived them in the course of a few days; and ultimately some changed to pupæ, from which the first fly appeared on May 9, 1889, and others followed in a few days after, having been in a retarded state for two years, a much longer time than that occupied by the Hessian troops in their journey from Hesse-Cassel to Long Island, and fully justifying the

name of the "Hessian Fly." This retardation of development [illegible] if disregarded, lead to immense damage being done.

The first figure is from a photograph showing the actual appearance of a number of damaged barley plants, such as first attracted the attention of Mr. Palmer, who, like a sensible man, examined into the cause of so many stalks being buckled down; and by stripping off the leaf-sheath at once disclosed the now well-known "flax-seed" puparia. This, then, is the appearance presented by Hessian Fly attack. I am particularly desirous of impressing this buckled-down appearance upon all who take notice of their crops (fig. 115).

The fly is a very insignificant creature, barely three-sixteenths of an inch in length, of a slaty colour, and in its habits very shy. I have seen only three or four specimens flying in the fields, and these but a short distance above the ground.

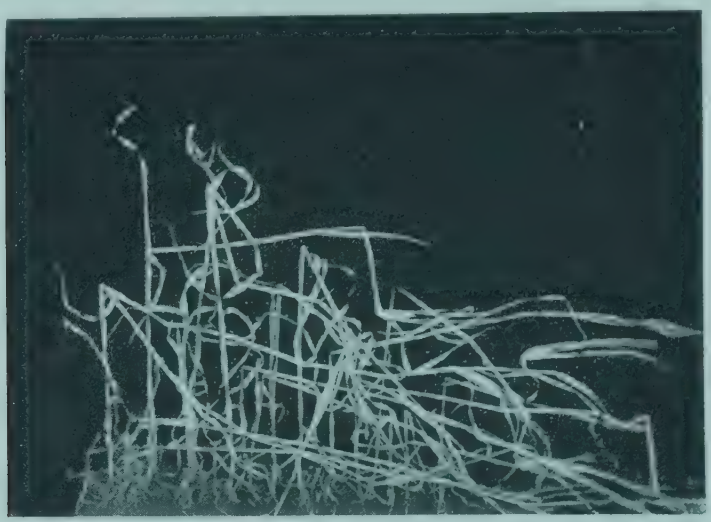

FIG. 115.—A NUMBER OF BARLEY PLANTS INFESTED WITH THE GRUBS OF THE HESSIAN FLY. (Greatly reduced.)

They emerge from the pupæ in May, and after mating the female lays its eggs (some 150 in number). Flying to a hanging leaf, she settles upon its upper surface with her head toward the stalk, and, bringing the tip of her body down, she protrudes her tubular ovipositor until it rests along the channel of the mid-rib; an orange-coloured cylindrical egg is extruded and adheres to the leaf; the fly moves forward a short distance and lays another, and so on until four or five, sometimes more or less, have been laid. This process is repeated upon other leaves until her supply is exhausted, when she dies. Now all the eggs have been laid with the head end towards the stem; so that, as soon as they hatch, the tiny maggots have nothing to do but proceed along the channel of the mid-rib until they reach the stem, when they force themselves between the leaf-sheath and it until further progress is stopped by the knot. Here they turn their body half-way round, bringing the mouth organs into contact with the stem, against which they then commence to rasp, feeding upon the exudations.

and slowly but surely so weakening the stalk that by the time (about four weeks) of reaching full growth it gives way and bends down to the ground.

The larva during the feeding stage is of a white colour, with a slight greenish line down its back.

Remaining in the same position, the larva, having done feeding, changes to a chestnut colour, the outer skin hardening in the straw. This is the quiescent puparium stage (fig. 116), the one in which the Hessian Fly was introduced into Great Britain and elsewhere.

At this stage I would call particular attention to the fact that the puparium has its head *down* and its *mouth* next the stalk, a position

FIG. 116.—SECTION OF FALLEN BARLEY SHOWING THE PUPARIUM OF THE HESSIAN FLY IN SITU. (× 6 diam.)

in which it would be impossible for the fly to emerge, as it would have to penetrate the stalk; and then, supposing that this was done, the fly would be a prisoner within the hollow stem between the two knots.

Some entomologists, in their haste to account for all and everything, have fallen into serious error in connection with the small chitinous apparatus, termed the anchor process, on the third segment of the mature larva found *within* the puparium—a stage so different from most other larval conditions on reaching maturity that a few words of explanation may be of interest to those who are not entomologists.

From the first appearance of the tiny larva of a moth or butterfly to its perfect state, its transformations are nothing more than a constant throwing-off of its *outer* skin; after the last moult the pupa is evolved, then the perfect insect.

With the larva of the Hessian Fly the last skin is *not* thrown off, but simply hardens and changes to a chestnut-red. The next change is a hidden one, only to be revealed by the most careful dissection and examination by removal of the outer skin, when a pure white maggot is found, having on the third segment a small forked apparatus known as the breast bone or anchor process, which, one entomologist asserted, "assisted the larva in obtaining its food," overlooking the fact that the anchor process did not develop until the feeding stage had been passed, and between it and the stalk the hard skin of the puparium intervened.

Arranging and fastening down a number of puparia in rows of ten, with their heads *down* and in one direction (as in their normal position), I dissected several in the first row, finding all the internal larva in the same position, viz. heads down and mouths toward the stalk. The next week I dissected part of the second row, with the same result. Some weeks later I found one of the internal larva with its head *up* and its back to the stalk! How had it managed to reverse its position? Continuing my examination of the larvæ, I found one with its head just on the turn, and closer examination showed that the forked and free tips of the anchor process were driven into the skin of the puparium, and, acting as a "scotch," prevented it from slipping down; the larva then by muscular effort moved its back down a very short distance, pressing the reverse spines covering its back into that of the puparium; the anchor tips were then withdrawn and moved a slight distance higher, the back again moved down, was "scotched," and so on, until by repeated action of this wonderful contrivance the larva reversed its position of head downwards and inwards to head *up* and *outwards*, with only the thin leaf-sheath between it and the open air, to penetrate which by the pupa was an easy task. In September these reversed larvæ changed to pupæ, and in a few days pierced the leaf-sheath and the perfect Hessian Fly was liberated. In America the autumn wheat is sometimes utterly ruined by the myriads of flies laying their eggs on the tender blade almost before any stalk has grown, the larvæ working their way right down to the grain, and often changing to the puparium stage inside the husk. Owing to the later sowing in Great Britain, the crops escape the autumn attack, though young plants of self-sown wheat are generally attacked.

Such, then, is a brief life-history of the Hessian Fly, which, partly owing to our climate and times of sowing wheat, does not appear to feel comfortable in our country. I might mention that at the time of its visitation I bred a very large number of parasites (fig. 117) from the puparia gathered. I suggested the advisability of collecting large quantities of the infected straw with the view of breeding vast numbers of these natural checks and turning them down in the infested districts, as they would do their appointed duty without the red-tape regulations of those unacquainted with their habits. This proposal of mine was disregarded by those in authority; so I wrote to my friend the late Professor C. V. Riley, United States entomologist, asking him if he would like me to send some puparia containing the parasites. He

replied by return, "Send me a ship-load if you can." I sent him three pill-boxes full, containing between three thousand and four thousand puparia. These Professor Riley distributed to three of his observation stations, where in due time the parasites hatched out and increased, and became thoroughly acclimatized.

Unfortunately, our Board of Agriculture has no such observation stations, or even officials noted for their expert knowledge of insect pests.

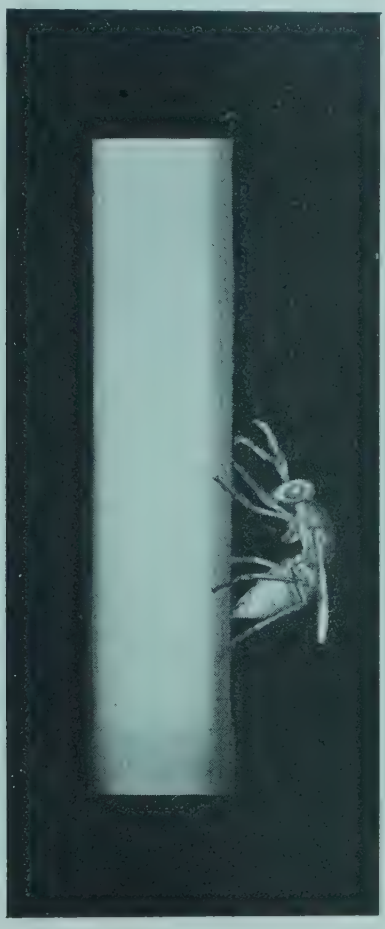

FIG. 117.—PARASITE OF THE HESSIAN FLY PIERCING THE LEAF-SHEATH (UNDER WHICH IS A GRUB) FOR THE PURPOSE OF LAYING AN EGG IN ITS BODY. (× 6 diam.)

On August 18, 1908, Mr. G. E. Mainland, F.R.M.S., of Tenby, sent to me a box of wheat-stalks from a field in that neighbourhood. Between the joints underneath the leaf-sheath were from six to nine legless larvæ of a bright red colour, resting in a curled-up position, each in a cavity in the stalk three-sixteenths of an inch in length, much resembling a niche in a cathedral wall, with a fungus-like growth at the top and bottom (figs. 118, 119). The larvæ were actively twisting about, evidently full-grown, for in a few days they left the stalks and buried themselves in the soil. Specimens were sent (by the owner of the field) to the Board of Agriculture and Fisheries for the name, and information how to deal with the pest, which had attacked the wheat and barley so that not a stalk had escaped. The advisers of the Board

informed the owner that the wheat was suffering from an attack of Hessian Fly, an assertion which I felt fully justified in flatly contradicting; and some months afterwards, when the larvæ had buried themselves and so got beyond control, the advisers informed the owner that the larvæ were those of "*Diplosis aurantiaca*, a dangerous wheat-pest."

I sent a photograph to Dr. L. O. Howard, the United States entomologist, head of the Bureau of Agriculture, who informed me that nothing of the kind had been seen in America, and that it was quite new to him. I kept the larvæ in the soil until June 1909, when, on examination, I found several in very much the same condition as when I last saw them. I asked Mr. Mainland to send me a good supply,

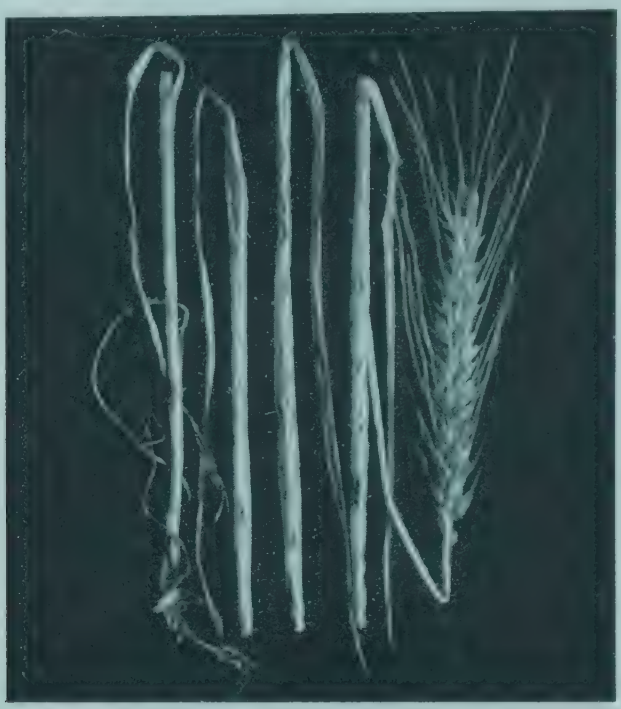

FIG. 118.—A WHOLE PLANT OF BARLEY SHOWING SLITS IN LEAF-SHEATH MADE BY GRUBS OF "TENBY WHEAT PEST." THE GRUBS, 6 TO 9, BETWEEN THE KNOTS ARE CONCEALED BETWEEN THE STALK AND THE SHEATH. (Half natural size.)

which he did on June 12. Some of these I observed change to pupæ, which very much resembled the larvæ in colour. Previous to pupating, the larvæ, by twisting and twirling about, managed to work themselves into the soil, where they scooped out a small oval chamber in which to pupate. Some of these I accidentally ruptured digging up, but in others I observed the larval skin cast and the pupa produced.

At first the legs were difficult to discern, as they scarcely projected beyond the body. In the course of a week the eyes and wings began to darken, and the legs became more distinct; the abdomen, too, and the dark dorsal marks stood out distinctly, until, just a month after pupating, I bred six female flies. These, together with my original photographs of the injured stalks, I placed in the hands of Mr. C. O. L. Waterhouse, I.S.O., who very kindly handed them over to Mr. E. E.

Austin, the dipterist at the Natural History Museum, who searched out the true name, viz. *Clinodiplosis equestris* of Wagner, whose figure of the injured stalk agreed in every point with my photograph.

It appears that Wagner obtained his first specimens in 1865 from Fulga, Cassel, Germany, but it has not been much heard of since that date.

Being anxious to learn as much as possible of this extraordinary pest, I determined to visit the infected district at Tenby. On June 12 Mr. and Miss Mainland visited the field and observed a vast number of midge-like flies swarming in the ridge (the field having been ploughed and potatos planted),

FIG. 119.—EAR AND PART OF BARLEY STALK INJURED BY THE GRUBS (IN SITU) OF THE "TENBY WHEAT PEST," CLINODIPLOSIS EQUESTRIS, WAGNER. (Natural size.)

A high wind was blowing, making the capture of specimens a very difficult matter; however, a male and two females were caught and sent on to me. I recognized the similarity of colour on the abdomen of the female, but could not say positively that these flies had emerged from the red pupæ, though I thought they had. Nothing more was seen of this great multitude of flies.

On July 9 I went down to Tenby, where by the kindness and with the guidance of Mr. Mainland, as well as the courtesy of the occupier of the field, I obtained a good supply of the larvæ by simply using my fingers to dig them up, their bright red colour making them very conspicuous objects in the sunshine.

I also swept up a number of the females from out of the rank grass and herbage growing around the field and hedges.

I placed the larvæ in a tin box containing soil taken from the field. This box I placed out in my garden at Holloway, covered in with cheese-cloth, but otherwise exposed to all sorts of weather, sometimes, especially during the present month of July, being flooded by torrential rains.

From time to time since July 1909 I have examined the soil, each time finding the larvæ alive; in winter they went down deeper.

It is a fact much to be regretted that here in Great Britain we have no Bureau of Agriculture such as that of the United States of America, where insect pests of all kinds are studied in their natural haunts by the various members of the staff, all of whom are expert field naturalists. Any farmer who finds a crop pest which is unknown to him can send it up to the Bureau, feeling certain that he will receive information at once; and, should the pest be a new one, one (or more) of the experts is sent down to work out its life-history. Had such measures been possible in the instance of the Tenby wheat pest the Board of Agriculture would have seen that the wheat and barley were at once burned, and so prevented the myriads of flies which emerged in June and after from coming to life.

This neglect may result in a vast army of devastating insects which may yet make their presence felt, for, unlike the Hessian Fly, the Tenby wheat pest has now successfully passed through a very trying English winter.

The work of studying these insect pests ought not to be left to those whose time is otherwise occupied, and who do it from an earnest desire to obtain knowledge which may be of interest and scientific value to their fellow-workers.

HOW TO BUILD A SMALL ROCK GARDEN.

By A. Clutton Brock, F.R.H.S.

[Read August 2, 1910.]

Rock gardens in this country are often designed, built, and planted by those who have no further concern with them. That, I suppose, is the reason why they are often faulty in all respects. The designer is not the gardener, and so does not correct his faults from experience. He is in the same case as an architect who should be always building houses and never living in them. I cannot claim to have a large experience in making rock gardens, but I have designed, built, and planted my own for myself, and experience has shown me where I was wrong very quickly and rather painfully. For my errors have either caused some of my plants to ail or die, or else they have made part of my rock garden look ugly. The main object of this paper is to prevent others from falling into the same errors.

I cannot give any general plan for a rock garden, because the nature of the plan must depend upon the size of the rock garden and the character of its site. Most of us have to make the best of existing conditions. I have had to make the best of a northerly slope, and I envy those who can make the best of a southerly one. The soil of my slope is dry and sandy, therefore it suffers more from drought than from lack of drainage. I could obtain southerly aspects only by digging a valley across my slope, and, even so, more of my rock garden looks north than south. But in my first plan I made one elementary mistake. I allowed one end of my valley to be open to the north-east, so that the north-east winds of March swept up it and killed off many southern plants that had just managed to keep alive through the winter. Therefore I will begin with this obvious piece of advice: Construct your rock garden so that the southerly part of it is thoroughly sheltered from the north and north-east, and, if possible, let the shelter be provided by the rock garden itself, not by hedges or trees. A rock garden should be in a situation as open as possible, so that it may have plenty of sun and fresh air. Trees and hedges and tall shrubs load the winter air with moisture, and they are out of scale with the plants and rock-work of a rock garden. There are plenty of plants, both easy and beautiful, that will thrive on a northerly slope and take no harm from bitter winds. Such a slope is the best possible protection for the more delicate plants grown on the other side of it.

As to the general shape of a rock garden, that must depend, of course, upon the site. If it is a valley, its main direction had better be N.E. and S.W., so that its slopes face S.E. and N.W. But, whatever the main direction may be, it is easy by windings and jutting

promontories to construct it with a great variety of aspects; and in any case there should be a sharp turn at the northerly exit, so that the exit may not let in the north winds.

The chief advantage of a valley is that it can be made to afford so many aspects, and if it winds and has slopes of varying steepness it escapes the monotony which is the chief fault of the valley form.

A valley, of course, must be made by two ranges, and where there is not unlimited space the inner slopes of these ranges should be, in the main, gradual, and the outer more steep. Thus there will be more room in the protected part of the rock garden than in the unprotected. But here and there should be steep jutting promontories of bold rock-work on the inner slopes, with subsidiary valleys running up between them, and one of these subsidiary valleys would be a good place, I imagine, to try one of Mr. Farrer's moraines, in which he grows the more difficult alpines with such success. It is a common fault of rock gardens, I think, that their slopes are too steep. It is true that a steep slope gives sharp drainage, but that, where necessary, may be provided much better by broken rocks under the soil. A valley with steep inner slopes is apt to suffer from lack of air, and the steeper the slopes the more rocks there must be and the less room for plants. The best plan, I think, is to make the outer slopes steep and to cover them with easier plants, reserving the inner slopes for the more difficult.

The valley form of rock garden cannot be sharply distinguished from the hollow form, for a valley is only an elongated hollow. Which you will have depends mainly upon the shape of your ground. If you have a square, flat piece of ground, form a hollow with slopes partly below the surface of the ground and partly above it. How far down you will dig must depend upon the nature of your natural drainage, unless you provide elaborate artificial drainage. I have myself no experience of badly drained sites. My own is only too well drained.

Much of what I have said about the valley applies to the hollow. Its inner slopes should be gradual and its outer more steep. Or, if you are cramped for space, make the southerly slopes gradual and the northerly more steep. In any case vary the contour with promontories of bold rock-work, and let there be little valleys leading out of the hollow between lengthened mounds, so that the rock garden does not begin and end too suddenly. The problem of paths is more difficult in a hollow than in a valley. The main path necessarily runs along the bottom of a valley. In a hollow it can be placed where you choose. If it runs straight across, it looks very artificial. It will be most useful and least ugly if it is made as unobtrusive as possible, winding about here between bold rocks and there between flat spaces, and being paved with rough flat rocks which will both mark its course and seem to give a reason for its existence. But this pavement must not, of course, suggest flagstones. The rocks should not be fitted too close or regularly together. Low plants, such as the Stonecrops, or *Campanula caespitosa* or *Thymus Serpyllum*, should break in between them here and there, but not so frequently or thickly as to make the pavement

like stepping-stones. The path should lead out at either end through elongated mounds, sinking gradually down to the level. There may, of course, be rock gardens of other shapes, as, for instance, a flat rock garden varied with mounds or knolls here and there. In this case it is difficult to make the mounds look as if they had any reason for their existence, and it is wisest, perhaps, to make the rock garden frankly artificial. A mound of irregularly built rock-work rising up out of an ordinary herbaceous garden is apt to look incongruous, but a charming effect may be produced by a raised oblong piece of ground enclosed in low walls, say, about 3 feet high, with a nearly flat rocky space on the top, if it is rightly placed. If you must have a rock garden close to a house, this is the kind to have. The enclosing walls make it harmonize with the regular masonry of the house, and the rocks on the slightly rounded top need not be obtrusive, and will enable you to grow many beautiful rock plants. I have seen such a little rock garden running parallel with the side of the house, with a path between them that looked both formal and natural, for there complete informality would have been incongruous. I can imagine, though I have never seen, a combination of rock garden and Dutch garden that would be very beautiful, formal in its main plan, in its walls, and in the shape of the beds, but those beds all filled with rock plants thriving among unobtrusive rock-work and looking far better than in a mere chaos of stones. One might not grow the most difficult plants, perhaps, in such a rock garden, but, after all, a rock garden is most successful when it is beautiful and agrees well with its surroundings. I have seen many ambitious rock gardens which failed in both respects.

I come now to the rock-work itself. If that is not rightly built, design and plants are alike wasted. For the building of rock-work I can only lay down some general principles, all of which the experienced gardener will no doubt violate in particular cases. But the beginner, if he will follow them, will avoid some common and fatal errors. Some of them are, or ought to be, obvious; but I mention them because I have often seen them violated in ambitious rock gardens with disastrous results.

In the first place, the main rocks, especially if the rock garden is of any size, should be as large as possible. I always wish mine were larger, but they have to be no bigger than I can safely handle by myself or with the help of one gardener. With these large rocks the main lines of the rock garden should be laid out. Smaller rocks can be fitted in afterwards where necessary. Needless to say, the rocks should vary in shape and none should look too geometrical. Thin flat rocks of the shape of paving-stones are almost useless, except as paving-stones. I myself use Bargate sandstone that sometimes splits into awkward spiky shapes, but otherwise is good enough for most purposes. The most useful rocks are those which can be sunk some way into the soil and yet will show a good bold surface above it. Most people, of course, will prefer to get their rocks from the nearest quarry that provides decent ones, whatever the kind of rock may be.

If rock-work is to be effective it must be massed, not evenly distributed over the whole rock garden; and this can be easily done in a rock garden of varying slopes, for the steeper the slope the closer and larger the rocks should be. Pile your rocks up boldly on your steep, jutting promontories, but on the gradual slopes place a rock here and there with broad spaces between. Above all things, never place a rock without considering what kind of plant is to be grown under it. The rocks are there, first of all, to help the plants to thrive, and not as architecture on their own account. I need scarcely say that all rocks should be placed so that the roots of plants can run under them; therefore it is useless to drive them down vertically into the soil; also that they should not overhang the plants so as to make a drip, though there are a few plants that thrive best where an overhanging rock protects them from rain without causing a drip into them. The rocks should be built so that they provide large and small, level, hollowed, and slanting pockets. The proportion of these must depend upon the kinds of plants grown and the climate and natural drainage. A plant like *Edraianthus Pumilio* needs to be wedged into a pocket as small as possible. A plant like *Androsace lanuginosa* needs a fairly large pocket, so that it may be increased by layers. There are many small plants like *Campanula excisa*, that like a long narrow pocket, as they run about from place to place, dying out in one spot and throwing up new growth in another. On the other hand, a large-growing plant like *Lithospermum prostratum* can be placed in a small pocket if there is plenty of room below for its roots, as it makes all its growth above ground, and that is the better for resting on rock rather than on the earth. But all this only means that the gardener should know the habits of growth of all his plants and provide for them accordingly. In wet climates, or where the natural drainage is not sharp, most of the pockets for the more difficult alpines should be sloping. In my own dry garden sloping pockets are fatal to plants like *Dianthus alpinus* or *Androsace carnea* that are impatient of drought. They prefer a flat or even hollowed pocket that is very well drained below. Even the easy *Androsace lactea* dies off in hot weather with me unless planted in a flat place. Speaking generally, those plants need flat pockets, at least in a dry, hot garden, which do not root very deeply, and so depend upon surface moisture. This cannot be given them in a sloping pocket, as it all runs away. So for them pockets should be made, which will hold the rain, but drained so that it will run down quickly to their roots and past them.

As to the artistic arrangement of rocks, the builder must trust his own eye. He can see when the rocks look chaotic or unnatural, as, if he has any experience of rock plants, he can see when they are not fitted for plant life. And he must persevere until they satisfy him.

I do not think that general directions are of much use in this matter; so much depends upon the lie of the ground, the character of the rocks, and the plants to be grown. But it is possible to arrange rocks so that they shall seem to be in strata, whether they are continuous or crop out of the ground here and there; and this can best be done with long

rocks or with rocks so placed in the ground that they look long. Strata on a slope look most natural when they do not run horizontally, but have themselves a slight slope up and down. The direction of strata on one side of a valley should always be the same. Nothing looks worse or more unnatural than a line of rocks sloping up in one direction, followed by another line sloping down in the same direction. Yet the strata should not be too long or too regular, and there is no difficulty in breaking them with bold masses of rock if the contour of the rock garden is sufficiently varied.

In the hollow circular form of rock garden it is not so easy nor so necessary to arrange rocks in strata unless the garden is very large. There the best effects are produced by contrasts of bold steep rock-work with more level spaces where the rocks are fewer. Where this is done each mass of bold rock-work should seem to be a centre or nucleus of a system of rocks, and the rocks in the intervening spaces should grow less frequent the further away they are from these centres. A circular rock garden is apt to look very chaotic where there are no contrasts of this kind, and where the rocks are evenly distributed without any system. Where the rock garden consists only of small mounds, it is impossible to do much in the way of systematic arrangement of the rocks. But if the gardener arranges them so that plants will thrive among them they will not look absurd. The worst absurdities are always produced by attempts to make a rock architecture without regard to the welfare of the plant, just as the worst absurdities of architecture itself are produced in buildings that are designed without regard to their uses. You will often see rocks in nature that are not favourable to plant life; but a rock garden is art, not nature, and the aim of all gardening art is to make plants look beautiful.

I come now to the arrangement of plants, and I can only speak of their artistic arrangement. They vary so much in their needs that it is impossible to give any general suggestions for their horticultural arrangement. The chief fault, I think, in most good rock gardens is that there are too many flowers in the flowering time. Many people think there cannot be too many flowers in any kind of garden. But if we try to analyse the peculiar beauty of wild flowers, and especially of mountain flowers, which it is so difficult to produce in our gardens, we shall find, I think, that it comes from the contrast between the flowers themselves and the flowerless spaces about them, and also from the contrasts produced by the different habits of the plants. In a rock garden, therefore, we should aim at varying our masses of blossom with masses of flowerless growth and at broad contrasts of habit. Upon contrasts of this kind a great part of its beauty will depend. But there is another matter to be considered, namely, scale, and that is equally important. The beauty of the smaller alpines is greatly marred when they are near some coarser-growing lowland plant, and the lowland plant suffers equally. In particular the smaller alpine shrubs seem to lose all their character and propriety if vigorous herbaceous plants are anywhere near them. Many people grow certain large plants reck-

lessly in their rock gardens merely because they are found in the Alps. This is another instance of the unintelligent imitation of nature. The white *Veratrum* or the Globe flower often look well enough on the slopes of a great mountain, but near the smaller alpine plants in a rock garden they look as incongruous as Madonna lilies or German irises. Docks and nettles grow astonishingly high among the Alps, but no one, I suppose, would therefore put them in a rock garden. It is useless to waste bold rock-work upon large lowland plants. The plants will dwarf any rocks possible in our gardens. If they are grown in the rock garden at all they should be upon its outskirts; and so should large shrubs like *Cistus cyprius* or *Cistus laurifolius*, or the larger brooms or Barberries. In my opinion the smaller plants should be grown among the larger and more massed rocks, as we find them in the Alps. Here, too, should be the smaller alpine shrubs. Where rocks are massed boldly little plants do not look meagre, and the rocks are a foil to their delicate beauty. If some easy-growing plants are to be grown among the smaller alpines, so that vegetation may not seem too sparse, the best and safest are the smallest houseleeks, such as *Sempervivum arachnoideum* and *S. Laggeri*. These, though they increase fairly fast, will not smother plants near them; and they do not seem out of scale with the smallest alpine. The alpine toadflax is a dangerous plant for the purpose, as it grows at a great pace in wet summers and will cover a small neighbour very quickly.

If once we make up our minds to observe scale in our planting we shall find the problems much simplified. Scale does not depend so much upon the size of a rock plant as upon its whole character and the size of its leaves. Thus *Lithospermum prostratum* and *Hypericum reptans* are not out of scale with small alpines, however large they may grow. But *Campanula carpatica* is out of scale because it has large leaves and the habit of a herbaceous plant. It again is a plant for the outskirts of a rock garden, and so are the larger pinks, because their flowers are borne on long stalks and their whole scale is large.

As in building rock-work the main lines should be laid down first with large rocks, so in planting the main effect should be secured first with drifts and masses of the more easily grown plants, combined with appropriate shrubs. Such drifts should follow the lines of the rock-work, and where one drift passes into another the plants may be mixed so that the change may not look too abrupt. It is worth noting that prostrate and low-growing plants look much better in long drifts than plants which have upright stalks. A line of these always looks artificial on rock-work. Like Lombardy poplars in a landscape, they should be planted singly so as to make a sharp contrast with the masses of prostrate plants. Nothing, for instance, could look more ineffective than a long unbroken line of *Saxifraga pyramidalis* in flower; nothing better than occasional heads of this varying a drift of *Lithospermum prostratum*. If it is massed at all it should be massed not in a drift but in a compact patch behind some drifts of a prostrate plant, so that its stalks will bend over and make a cloud of blossom. And here I may remark

that this Saxifrage, at least in dry, sunny gardens, is not a plant for narrow, sloping cracks between rocks, but thrives best in a large flat pocket with rich soil, where its offsets have room to grow large. Again, an upright plant like *Polemonium mellitum* looks its best rising here and there on the north side of the rock garden among quite prostrate plants such as *Saxifraga apiculata*.

Where there are bold drifts it is much easier to plan good contrasts or harmonies of colour, than where the plants are merely dotted about; and strong contrasts of colour should be varied by quiet harmonies, or more contrasts of growth or leafage. Thus I found in my own rock garden that an accidental contrast of *Lithospermum prostratum* with the pink Phlox 'Vivid' looked well enough because it was mitigated by a mixture of *Tanacetum argenteum* with its grey leafage. In fact it is possible to combine flowers of almost any colour with good effect if only they are well mixed with quiet-coloured foliage or with white flowers. So where there are bold contrasts of colour it is well to soften them with an intermixture of white-flowered plants, such as the dwarf Achilleas, and with grey-leaved plants such as the excellent *Tanacetum* I have just mentioned, or the prostrate Artemisias, or the Aizoon Saxifrages, or *Antennaria*, or the woolly thyme. There is particular need of these low-growing, grey-leaved plants on flat parts of the rock garden, which are so apt to look like mere herbaceous borders if not carefully planted. In such flat spaces scale is more important than anywhere else, and any large lowland plant will destroy the whole effect. Often in a rock garden one sees such a flat space, with a few rocks placed at random, covered with plants such as Iceland poppies or Canadian Phlox, or the larger pinks, a space which lacks both the neatness of a border and the character of a rock garden, and which looks hopelessly ragged and spent by July. Although one may grow no choice plants in such places yet one can exercise much care and skill in planting them, so that they are in character with the rest of the rock garden and never look overgrown or autumnal. In them, as elsewhere, such rocks as there are should be massed, and as large as possible, with broad rockless spaces in between that may be covered with neat prostrate plants of easy culture. There mix drifts of *Viola gracilis* with the woolly thyme, keeping the thyme well in bounds with frontiers of rock. That is the place also for large patches of the Gentianella, of *Campanula caespitosa* mixed with *Sedum album*, *Dryas octopetala* mixed with *Globularia cordifolia*, and variety of height should be obtained, not by larger lowland plants, but by shrubs such as the smaller Veronicas, *Berberis dulcis nana*, Iberis 'little gem,' *Iberis correaefolia*, and the dwarf Philadelphus, with here and there a larger mass of *Santolina incana* or *Helianthemum formosum*. But the shrubs should not be in too great variety, or the whole effect will be chaotic; and they must be very carefully placed, and, if necessary, kept well within bounds by clipping. Those flat spaces are also the places for bulbs, if bulbs are grown in the rock garden. The smaller daffodils and tulips and the choicer irises may be planted in drifts under a carpet of *Sedum dasy-*

phyllum; stronger stonecrops such as *Sedum album* are apt to smother them. They look their best nestling in patches close to small shrubs.

There is nothing so important for the general effect of the rock garden as the right choice and placing of shrubs. In my opinion too large shrubs are often used and misused. It seems to me that the larger Cistuses, such as *Cistus cyprius* or *C. laurifolius* and the larger brooms, are out of scale, except where used as a background in very large rock gardens.

What is needed is shrubs which, whether prostrate or not, are compact in habit and, at least, look as if they were mountain plants. Only the more prostrate shrubs, I think, should be planted on the top of a mound; upright shrubs look like monuments in such places; and we must remember that in the mountains the heights are wind-swept, and so covered only by the most prostrate plants. The beautiful prostrate Savin never looks better than when it grows high up in a flat place surrounded with some grey stonecrop or with patches of *Sempervivum*; and it is well to repeat the effect in another flat place a little lower down and a few yards to one side of it. On the other hand, rounded or upright shrubs look their best half-way down a slope with a background of bold rock-work; and, as I have said, they should have no large plants near them to put them out of scale. In fact, the more I see of rock gardens the more I am convinced of the importance of filling them only with plants that are not only rock plants but look like rock plants. We hear a great deal about the need for variety in rock gardens, but there is, I think, more often too much variety than too much monotony in them, and it is easy to get enough variety in colour, leafage, and habit of growth with a selection of plants that are all thoroughly in scale. The height can be varied, not only with the smaller, upright, and rounded shrubs, but also with rock plants that throw up erect flowering stalks, such as many Saxifrages, the Sempervivums, many rock pinks, the smaller Achilleas, *Aethionema grandiflorum*, *Lithospermum graminifolium*, *Papaver alpinum*, *Aster alpinus*, or *Campanula barbata*. And the smaller the rock garden the more carefully scale should be observed. In very large rock gardens, with very bold rock-work, the larger mountain plants may be grown, but even then they should be kept well apart from the smaller alpines, and particularly from Alpine shrubs. I have seen *Ostrowskia magnifica* recommended as a rock plant, chiefly, I suppose, because it is considered difficult to grow, and *Incarvillea Delavayi* used to be often planted in rock gardens, while it was still a novelty. Both these plants seem to me quite unsuitable, unless we are to regard a rock garden only as a nursery for rare or new or difficult plants. If we use it as a means of achieving a kind of beauty not otherwise obtainable, we should be careful to eliminate any plants which, however beautiful in themselves, are not in character with that peculiar kind of beauty.

SOME LITTLE-KNOWN GRAPES.

By A. C. Smith, Assistant-Superintendent R.H.S. Garden, Wisley.

[Read August 16, 1910.]

The earliest references we have of grapes being grown in England is in the year 1285. At this remote period grape-growing was apparently an important industry, for we learn that vineyards were extensively planted near Winchester, and it is generally supposed that this town took its name from the fact that it was the centre of the wine-making industry. Of the same period it is reported that vines were grown out of doors as far north as the county of Derby, the village of Wingerworth taking its name from vineyards flourishing in those parts. There is also a well-founded tradition that the Archbishop of Canterbury had an extensive vineyard attached to his palace at Charing in Kent. It thus seems undoubted that wine grapes were at one time extensively cultivated in this country.

That the cultivation of the vine outside was eventually discontinued here may be due to two reasons: first, that in all probability better flavoured wines could be brought from France, and, secondly, that agriculture was rapidly advancing at that time, and, being more profitable, it eventually ousted the grape. One of the finest vineyards to produce good wine was that at Pains Hill, Cobham, not far distant from the Royal Horticultural Society's present Garden at Wisley, where we are told that wine quite as good as any produced on the Continent was made.

No great progress seems to have been made with the cultivation of the grape as a dessert fruit until about the year 1718, when the Duke of Rutland had his garden walls fitted with flues, and by so doing was able to obtain ripe grapes in July by carefully matting them up at night. This seems to have been the commencement of grape-growing for dessert purposes. There are no reliable records concerning the varieties he grew, but we have proof that in 1724 'Muscat of Alexandria' and 'Black Hamburgh' were being grown, although they were not considered to be hardy, and consequently were not much planted.

Somewhere about that period, however, vineries were built, and the cultivation of good grapes was seriously taken up, and new varieties were constantly being raised and tried. When we see the fine bunches of the varieties already mentioned which are annually exhibited at Shrewsbury, Edinburgh, London, and other large shows, it must be admitted that these two varieties more than hold their own; in fact, special classes are always provided for them. The large vine at Hampton Court, from which most excellent fruit was exhibited only last year, was planted as long ago as the year 1769, a fact that proves not only the longevity of the vine, but shows how this fine grape has

stood the test of time. Grape-growing has during the last fifty years become quite an art, towards the perfection of which the Royal Horticultural Society has done very much. A special feature of vine cultivation has always been made in the vineries both at Chiswick and at Wisley. Numberless varieties have been tried and many discarded, and now we have a standard collection planted at Wisley numbering over forty varieties, and it is of some of these I propose to speak, as they very properly come within the designation of "some little-known grapes."

I know of no kind of glass house which affords more pleasure in summer to its owner than a well-stocked vinery, and for the amateur who has room for only one vine there is no grape more suitable than 'Black Hamburgh.' It has a strong constitution, grows vigorously, is of good flavour, and is also a free setter. Should, however, a Muscat-flavoured grape be desired, I would strongly recommend 'Muscat of Hungary.' This is a delicious grape with a pronounced Muscat flavour. The bunches are not large, but when well grown the berries attain a nice size, are of a pale greenish-yellow colour, and will keep till well after Christmas, retaining their full Muscat flavour. It sets quite as freely as 'Black Hamburgh' and is well worth a place in every collection. It is frequently called the 'Small-berried Muscat of Alexandria.'

'*Chasselas Napoléon.*'—This is a grape with many synonyms. Its origin is not known. It is a variety which has been a long time in cultivation, but it is an error to classify it amongst the Chasselas section. How it got there in the first place is a mystery. Although it is not cultivated in quantity anywhere, isolated specimens are not rare. In warm districts the fruit is of a soft golden colour, whilst further north it keeps its transparent white tint, which justifies one of its synonyms, the Large White Pearl (*Grosse perle, blanche*). As a dessert grape it must be classed amongst the most beautiful and the most decorative, and, started at the same time as 'Black Hamburgh' or 'Foster's Seedling,' it will be ripe quite a fortnight before them. 'Chasselas Napoléon' does best if worked on a Muscat, and has been exhibited in splendid condition on many occasions by Mr. Jordan, formerly of Impney Gardens, Droitwich. It is desirable to practise artificial pollination. This grape is largely grown under glass around Paris, and sells well. One grower, from a vine twelve years old, gathered in 1900, 125 bunches, weighing on an average over 2¼ lb., and in 1909 he gathered 170 bunches, averaging 2 lb. 3 oz. At Wisley it is a strong grower, making handsome bunches, and will frequently set three clusters on one lateral, proving how very prolific a variety it is. Intending planters will never regret including this fine grape in their collection. It received a First-class Certificate from the Royal Horticultural Society on October 27, 1891.

'*Muscat Champion.*'—This is without doubt one of the most handsome and finest flavoured grapes grown. It was raised by Mr. Melville, gardener to the Earl of Rosebery, and is a cross between 'Canon Hall Muscat' and 'Mill Hill Hamburgh,' being sent out about the year 1858 by Messrs. Veitch, of Chelsea. It is sometimes rather

disappointing when in the young state, being slow to start, but the second year, as a rule, it makes gross wood. It is advisable to shade slightly, as the wood frequently scalds and so does not ripen well, but if the shading is attended to at the right time, no difficulty will be experienced in finishing the wood properly. It is a midseason grape, of a foxy red colour, with large berries, approaching those of 'Gros Colmar' in size. Many are inclined to think from its appearance that it is not ripe, but, in spite of this, no finer flavoured grape can be grown, and where high quality is desired it should always be included. The skin is thin, and, being a larged-berried variety, great care should be taken when thinning to leave abundant room for swelling.

'*Prince of Wales.*'—Among the new grapes this one is sure to hold a leading position, because of its fine size and appearance. It originated as a sport from 'Mrs. Pince' in the gardens of Captain Stirling-Maxwell, of Keir, whose gardener (Mr. Thomas Lunt) is a well-known and skilful grape-grower in the North, and, like many other really good things, it was sent out by Messrs. Veitch, of Chelsea. It inherits from its parent some of the fine Muscat flavour which is so pronounced in that variety, but has much larger bunches and berries of a roundish oval shape and blue-black colour. It is a good keeper, and although with age it loses a little of its deep colour, it retains its fine flavour until the berries shrivel. It received an Award of Merit from the Royal Horticultural Society on September 25, 1900, and was granted a First-class Certificate in 1908, when shown in the Wisley collection at Vincent Square. It has proved a strong grower and free setter, but it is, like 'Mrs. Pince,' a little averse from too much bright sunshine, and colours and finishes better if slightly shaded during the brighter hours of the day. When pruning it is advisable to leave at least three good buds, as the better bunches are thrown on the young wood. For exhibition purposes it makes a splendid companion to 'Canon Hall Muscat.' It is well worth planting, both as a midseason and as a late variety.

'*Black Prince.*'—This is one of our earliest Sweetwater grapes, and well worth including in all collections. It is one of the earliest grapes to ripen, and is extremely handsome, having long tapering bunches, frequently from 18 inches to 2 feet in length. The berries are medium sized, with a heavy bloom. It is a free grower and sets freely, and the fruit is very juicy and sweet. For exhibition purposes it is an excellent grape, as it usually finishes well, but it should be eaten immediately it is ripe, as it will shrivel if allowed to hang long.

'*White Nice.*'—This grape should undoubtedly be in every collection, as it is a late-keeping variety. It is a good grape when it is allowed to hang, firm, sweet, and of good flavour. The vine is a vigorous grower and produces very large bunches. One grower is reported to have exhibited a bunch of this variety weighing 25 lb. 15 oz. Its cultural requirements are similar to those of 'Black Hamburgh,' but it will keep a great deal longer. It is of a pleasing colour

when well finished, almost like a Muscat, but the berries are a little smaller and round. When well shouldered-up it makes a handsome bunch. It is very strange that such a useful grape should be so seldom grown.

'*Lady Hastings.*'—This variety was raised by Mr. Shingler, of Melton Constable Gardens, and received a First-class Certificate on July 25, 1899. It originated, I believe, as a sport from 'Muscat Hamburgh,' and has all the good qualities of its parent. This excellent grape does not require such a long season to ripen as do many other varieties, and is found by many gardeners very difficult to grow or fruit. It does best if the roots are confined and not given too much run, and it does not object to copious supplies of good food, being a strong grower. If a little attention is given to the pruning and after-management of this vine there should be no difficulty in getting it to make good growth and bear fine bunches. Do not prune too severely—leave at least three good buds. At Wisley it does well, always commencing to colour first. It will not hang long, and should be eaten at once, otherwise the colour changes and it loses a great deal of its rich Muscat flavour. If started with 'Muscat of Alexandria' it will be ripe quite a fortnight earlier. Unless the wood is thoroughly ripened it will be found disappointing, for herein especially is the secret of success—not too much rooting space, and thorough maturity of the wood; and for this reason alone it is by no means advisable to give it an outside border. The berries are large, of a blue-black colour, and rich Muscat flavour, while the bunches are, as a rule, long and heavily shouldered. It is undoubtedly one of the finest grapes introduced of late years.

'*Appley Towers.*'—This is one of the handsomest of the late grapes, is of first-class quality, and makes handsome bunches, with large, deep black berries. It requires well thinning or it is liable to split, much in the same way as 'Madresfield Court' does, and it is also more subject to mildew than many other varieties are; in fact, I have seen it when grown in a mixed collection very badly disfigured by mildew when others in the same house have been free.

'*Cornichon Blanc.*'—This is the Lady's Finger Grape, so called on account of the long curved form of berries, which are often an inch and a half in length and covered with bloom. The flesh is firm and sweet, the bunches of good size and handsome appearance. It is well worth growing if only for its decorative value. Mr. Taylor, of Byram Park Gardens, grows it well, and with him it makes large and handsome bunches of good flavour, and is very much appreciated as it hangs late and is always of good flavour. The vine is a vigorous grower; the wood, when ripe, is of a pale straw colour, and it usually ripens well. It would make an excellent stock for some of the weaker growing varieties. As good late white grapes are few, this variety is well worth planting, as the bunches are much appreciated at Christmas.

'*Black Monukka.*'—This grape might well be termed "the Nursery Grape" for it has few or no seeds, which makes it comparatively quite

safe for children to eat. It is a strong grower, making very large bunches, heavily shouldered, and frequently measuring 24 inches in length. The bunches do not require a great deal of thinning, as the berries never get large. The berries are peculiarly shaped and the colour is a grizzly red, or occasionally black with a slight bloom. In pruning this variety it is advisable to leave plenty of young wood, as it will not fruit if severely pruned. The vine requires plenty of room, the bunches being borne some distance from the rod. The foliage is particularly useful for decoration, as it colours finely in the autumn. The flavour of this grape is most pleasant and refreshing. Its origin is not known, but it is supposed to have been sent to the Society from India.

'*White Tokay.*'—A great deal has been written both for and against this grape. When well grown and properly finished it is undoubtedly a very fine late white. The bunches are large, well shouldered, and tapering, with large berries of a greenish-white colour, firm, yet tender and juicy, and when well ripened the flavour is rich. It is a particularly strong grower, makes strong wood, which usually ripens well; but to have this grape at its best it requires a long season and time to finish well, or the result will be disappointing.

'*White Frontignan.*'—This delicious grape was sent from Hungary and is one of the finest flavoured grapes grown. To the amateur who has one vinery this is quite a good grape to grow. I have seen a vine of this variety in a cold greenhouse within twelve miles of London carrying a hundred nice bunches of beautiful fruit with a strong and delicious Muscat flavour, and I was informed that each season it bore splendid crops. It makes a bunch of medium size, with small berries, and the vine is a strong grower.

'*Ascot Citronelle.*'—This is one of the earliest of all grapes to ripen. The berries are small, of a beautiful amber colour when ripe, and have a decided Muscat flavour. It will ripen three weeks before 'Black Hamburgh' grown in the same house, and is very useful as a pot vine, being extremely fruitful, and, although small of berry, its flavour commands a place for it where a first-class early grape is desired.

'*Duchess of Buccleuch.*'—This variety is certainly a little difficult to manage, but with care it is quite possible to grow it well, when it will be found to be one of the finest flavoured grapes grown, but it is seldom met with. It should be grown in the Muscat house, as a little more heat is required to finish it than with some, although I have seen fine bunches grown in mixed houses and finished perfectly. Unless a little fire heat is given during the time the berries are colouring they do not finish with the fine golden colour this variety should show, but will retain a greenish tint and are never so sweet.

'*Grizzly Frontignan.*'—This is one of our very oldest English grapes, introduced by Sir William Temple in 1654. This delicious grape was at one time to be found in almost all collections, but has dropped out of late years owing undoubtedly to its size and appearance. I am

pleased to say that it is now again finding favour, for it is a most delicious grape to eat. The berries are small, of a foxy-red colour, the bunches long and tapering, with a tendency to shank, but if grown on the extension system and young rods run up each season this trouble can be overcome to a great extent.

'*The Syrian Grape.*'—This grape is supposed to be the variety mentioned in the Old Testament, which the twelve spies sent to view the land of Canaan cut down and carried back between two of them on a staff. This grape is not generally grown, but it is worth a place. It is a strong grower and makes very large bunches; the berries are a greenish-white, but when well grown they will finish with quite an amber tint, while the flavour is pleasant, the berries sweet and juicy. The largest example of this variety grown in this country was that grown by Mr. Speechly, of Welbeck Gardens, when one bunch weighed over 19½ lb. This the Duke of Portland presented to the Marquis of Rockingham, of Wentworth House, and it was carried a distance of twenty miles by four labourers, who carried it on a staff in turns between them, thus repeating in modern times the method in vogue in the days of Moses.

This brings my brief summary to a close. Several of the varieties mentioned are little known, not by reason either of any difficulty in cultivation or of their inferiority, but rather because of their accidental failure to command attention when they were first introduced. I certainly feel that several have been dropped before they had been thoroughly tried, or their places have been taken by others purely on account of their appearance, and in total disregard of the fact that dessert fruits are meant to be eaten and not only to be looked at.

The grape is a kingly fruit, it deserves royal food and lodgment, and in return it will yield the grower a right royal feast.

All the varieties mentioned are to be seen growing in the Wisley collection, and all grow and fruit excellently there.

THE ORIGIN AND HISTORY OF OUR GARDEN VEGETABLES AND THEIR DIETETIC VALUES.

By Rev. Professor G. Henslow, M.A., F.L.S., V.M.H.

II.—ROOTS AND TUBERS (*cont.*).

Potato.

The history of the Potato has often been written, but perhaps one of the most complete accounts was by "W. S. M." in the "Gardeners' Chronicle" (April 17 and ff., 1886), from which the following items are partly extracted.

The first to write about and figure the potato in England was Gerard in his "Herbal," 1597. He describes the "Potatoes of Virginia, *Battata virginiana siue virginianorum, et Papus.*" He says that he received roots from Virginia, and compares them with the former or "common potatos," by which he means the sweet potato.

The portrait which forms the frontispiece of the "Herbal" represents Gerard holding a spray of the potato, having leaves, flowers, and fruit, in his hand, so that it was evidently at that time a remarkable plant. Indeed, he seems to have first received it only about ten years before the "Herbal" was published. "W. S. M." gives an interesting account of the various voyages to America, and shows that Gerard was in error if he supposed the potato to have been a native of Virginia—*i.e.* the island of Roanoke,* not the present State of Virginia on the mainland.

Before Gerard's time the potato was known to Continental botanists. Clusius in 1588 had received two tubers at Vienna, sent from Belgium. Earlier still, by at least one year, it had been received at Breslau, and was growing in the garden of Dr. Scholtz. Bauhin, in 1596, alludes to an "*iconem suis coloribus delineatum*" of the date 1590.

As to the origin of the name *Papus*, Gerard says: "It groweth naturally in America, as reporteth C. Clusius." If we have no record of its actual first discovery, we at least have records going as far back as sixty years earlier than the date of Gerard's writing, and these records take our attention to South America. Pedro Ciaza de Leon, in a work published at Seville in 1553, speaking of the fields and crops of the villages of the Collao district of Peru, says: "Their principal food is *papas*, which are like earth-nuts." Tracing the use of this word in the writings of Bauhin (1596 and 1620) and of Clusius (1601), it cannot be doubted, though there is no Spanish authority, that the potato is really meant, its name being an Anglicized form of *Battata*.

* So Bauhin writes: "They were first brought from the Island Virginia into England and thence to France and elsewhere."

For special details as to verification of names, &c., the reader is referred to the articles themselves.

Solanum tuberosum is the name Linnæus fixed for the cultivated potato, but much discussion has taken place as to the correct botanical species. One called *Solanum Maglia* (figured in the "Hort. Trans." vol. v. Pl. 11, p. 240) and described as *S. tuberosum* (wild potato), is the same as that found by Darwin in the Chonos Archipelago. Mr

FIG. 120.—STEM AND FOLIAGE OF THE POTATO PLANT, AFTER CLUSIUS. (*Gard. Chron.*)

Baker, however, does not regard this as the real origin of the potato, which is a native of Chile and Peru.

With regard to the nutritive value of potatos, they are very deficient in nitrogenous ingredients or flesh-formers, and can therefore be used only as a farinaceous addition to meat. There is 75 per cent. of water, the rest being mainly starch (18 per cent.), the albuminoids only amounting to 1·2 per cent. The nutritive ratio is 1 : 17, and the nutrient value 22. Sir A. H. Church adds that, according to Frankland, 1 lb. of potatos will supply force in doing external work to the amount of raising 124 tons one foot.

Radish.

The Radish was known to the Greeks as *Raphanos*, and to the Romans as *Raphanus* and *Radicola*, "little root." The herb has been cultivated from time immemorial. Perhaps the earliest allusion occurs in Herodotus '* account of the building of the great pyramid of Egypt.

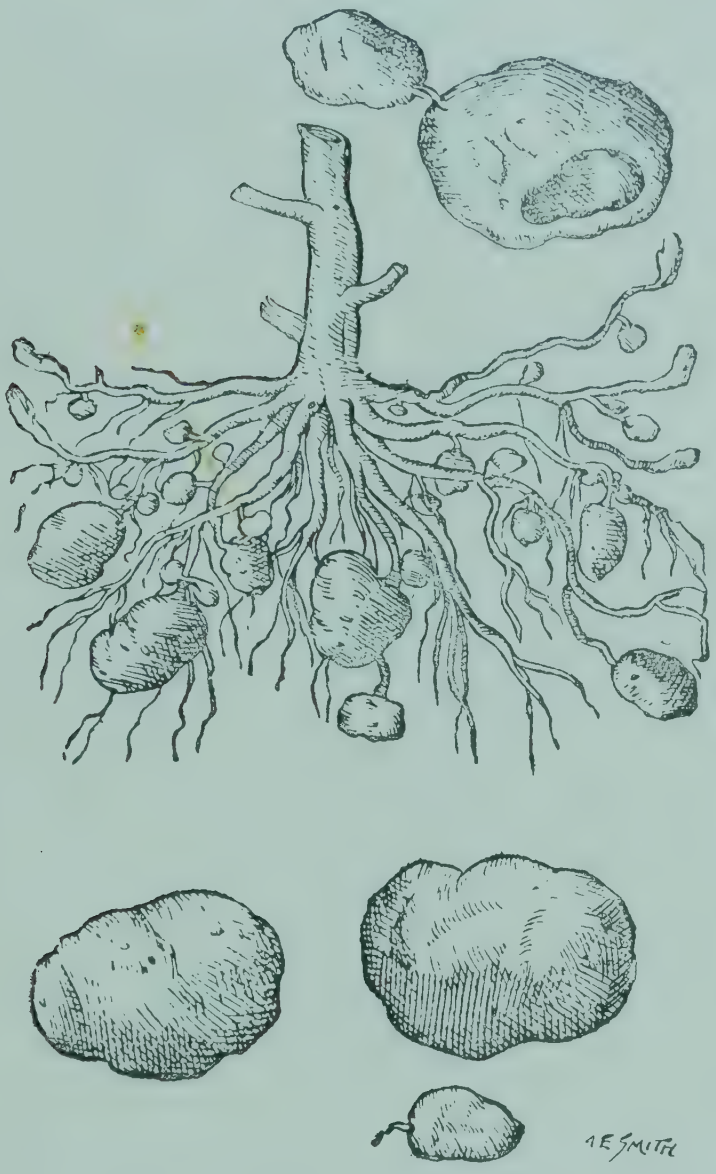

Fig. 121.—Roots and Tubers of the Potato Plant, after Clusius. (*Gard. Chron.*)

He says: "On the pyramid is shown an inscription in Egyptian characters stating how much was expended in radishes, onions, and garlic for the workmen, which amounted to one thousand six hundred talents of silver."

Pliny speaks of several varieties, but one, the "wild," clearly refers to the horseradish. "The Syrian is pretty nearly the mildest and the

* Herodotus was born 484 B.C.

most tender of all, and is well able to bear the winter." He describes the radish as "requiring a loose, humid soil. . . . Some authors have mentioned a plan of making a hole with a dibble, and covering it at the bottom with a layer of chaff six fingers in depth; upon this layer the seed is put, and then covered over with manure and earth; the result of which is that radishes are obtained full as large as the hole is made." From this one gathers that the radish in Italy grew to a much larger size than is usual in England. Those for sale at Gibraltar and Cairo to-day are about eight inches in length and one and a half in diameter, the leaves being more than a foot in length. He adds that they were often watered with brine or nitre in Egypt. This would tend to enlarge the roots, and, according to Pliny, makes them remarkable for mildness by subduing the natural pungency. He remarks, with regard to the Greeks: "Such is the frivolity of the Greeks that in the Temple of Apollo at Delphi, it is said, the radish is so greatly preferred to all other articles of diet as to be represented there in gold, the beet in silver, and the rape in lead." He concludes with the quaint idea of antipathies among plants in his day: "There is a great antipathy between the radish and the vine, which last will shrink from the radish if sown in its vicinity." We have seen that Gerard refers to the horse-radish in this connection.

In the Middle Ages the radish was known as *Raphanum vel radix* or *rædic*, in the tenth century the Anglo-Saxon name being *Wyrt-truma*, signifying "root-holder" or "root-support." In the sixteenth century we have many illustrated books on plants; thus Dodoens (1559) figures *Raphanus sativus*, the root being swollen at the top only, with a small tapering end below; the pods are not constricted, but pointed and ovate. Turner in his "Herbal" (1568) reproduces Dodoens' figure, and adds two more; the one is an elongated conical-shaped form, the other the turnip-rooted, with a very short continuation of the tap-root. He says: "This kind is more common about Strasburgh and is seldome seen in England."

In Matthiolus' commentary upon Dioscorides (1574) we have a decided improvement, the long form as well as the round closely resembling our present roots. He gives two figures and represents the pods as having *one* constriction only, in the middle, more decidedly in those of the turnip form. The pods of the long-rooted are represented as having six seeds (in one laid open); the pods on the plant are barely constricted at all.

Lobel, in his "History of Plants," has two figures of elongated roots, one being more swollen at the summit, but not a true turnip-formed root. The pods on both have a decided, single constriction. Gerard (1597) illustrates four varieties. The *Raphanus sativus*, or "garden radish," is not elongated, but a short sub-truncated oblong form; *Radicula sativa minor*, "small garden radish," is like a very small one of to-day; *Raphanus orbiculatus*, or "round radish," is a large one, nearly two inches in diameter; while the last is called *R. pyriformis*, "the peare fashion radish."

Judging, therefore, from the figures given, we do not seem to have improved or "ennobled" the radish since the sixteenth century.

The question now arises, What wild species was the origin of the cultivated forms? Let us continue the research through later writers, and it will appear that the radish was not derived from China, as some writers have asserted, but from South Europe.

Parkinson in his "Theatre of Plants" (1640) figures a carrot-like and a turnip-rooted form. Both have short-pointed pods with a slight constriction. The one is called "*R. vulgaris*, ordinary garden Reddish" (a misnomer from the colour), and the other is "*R. niger, rotundiore radice*, the rounder-rooted blacke Reddish."

The wild radish he figures under "*Rapistrum album articulatum*, white wilde Charlocke," with long articulated siliquas. This appears, therefore, to be *Raphanus Raphanistrum*, L.

Eighteenth Century.—In Tournefort's "Compleat Herbal" (1730, vol. ii., p. 466) the pod of the garden radish is well represented as slightly constricted, striated, and sharp-pointed; the flowers are purple. Tournefort describes *R. major, orbicularis vel rotundus*, with white or purple flowers; *R. niger*, with smaller leaves and deeper jagged (serrated?). "Parkinson sowed the seed of this species, which produced plants, some of which had black roots; but the greatest part were covered with a white skin." Lastly, *R. minor, oblongus*, with oblong root.

In his "British Herbal" (1756) Dr. John Hill first describes "The wild white radish" *R. sylvestris, radice albente*. His figure of this is a two-seeded constricted and pointed pod; the leaves lyrate, but the segments all connected: "It is found in some parts of Sussex, principally near the sea-coast. . . . Ray calls it *R. maritimus flore luteo, siliquis articulatis secundum longitudinem eminenter striatis*. One would think that the garden radish was raised from this, but for the colour of the flower" (p. 243). He then describes the garden radish, *R. vulgaris*; the round, black radish, *R. radice rotundo nigro*; and, lastly, the long, jagged-leaved, black radish, *R. foliis laciniatis radice longo nigro*. The last two are figured, the foliage being very distinct; but the pods are similar to those of the first mentioned. Hill says that the garden radish and the last-named are natives of Spain; the round, black radish, of Italy. With regard to the colours of the flowers of the Spanish-Italian varieties, the flowers are white with a tinge of purple or red, some more, some less. The pods are jointed in all.

Taking Miller's "Dictionary" as an example, the author mentions *R. sativus* and three others as constant varieties, and *R. Raphanistrum* as distinct. It is called "the white-flowering Charlock with a jointed pod." He also observes that "the small round-rooted radish is not very common in England, but in many parts of Italy it is the only sort cultivated."

Nineteenth Century.—In the "Prodromus Syst. Nat." of A. P. de Candolle (1824) we find seven species described, as well as two doubtful ones. Of *R. Raphanistrum* there are three varieties, with

white, yellow, and purplish flowers; while *R. maritimus* flowers are yellow, and scarcely veined.

From the foregoing abbreviated descriptions it will be seen how all the characters relied upon are variable, as Bentham observes; and, judging by the figures of the siliquas, they certainly are constricted, but in that of Tournefort the constrictions are much reduced under cultivation, so that it does not appear surprising that they should vanish altogether. *R. maritimus*, being a South European type, will account for the tenderness sometimes shown in the radish; so that the general result appears to be that radishes have been raised in many countries from the local sub-varieties of this variety of *R. Raphanistrum*.*

Fig. 122.—Wild Radish (*Raphanus Raphanistrum*).

With regard to the two principal forms of the root of the garden radish, the long, spindle-shaped and the globular turnip-formed, M. Carrière describes his experiments with the wild species *Raphanus Raphanistrum*, L. (fig. 122), growing them from seed in two very different soils during five consecutive years. Some were grown at Paris in a light soil, others in the country in a firmer or strong soil, argillaceous and calcareous. At Paris the long form prevailed almost entirely. It was just the contrary elsewhere; the tuberous form was most abun-

* The last seven paragraphs are quoted from the *Gardeners' Chronicle*, June 25, 1898, p. 389.

dant. At Paris the colour was rose or white; while the others were of a deep violet, and some had a pronounced brown colour or were nearly black, like the Alsace *Navew*; but there were pretty well all colours and forms * (figs. 123, 124).

Rampion.

Campanula Rapunculus, L., is a native of England, but considered as doubtfully wild by Hooker. It occurs from Denmark southwards, in N. Africa and Siberia. Whether this root was known to the ancients is not certain. Dodoens (1559) says the Greek name was *Gongulē*

Fig. 123.—Long Form of Radish raised by M. Carrière from the Wild Radish.

agria, but this could hardly mean anything else than the wild turnip, or probably a degenerate form of the garden turnip, as the name implies a "round" root. Aristophanes uses the word *gongulis*, but the plant cannot now be identified. In the sixteenth century we find two distinct plants called Rampion: one was known as the greater *Rapuntium*, now recognized as *Phyteuma spicata*, L., and the smaller was *Rapuntium parvum*. This is the true rampion, *Campanula Rapunculus*, L. Their use was described as being especially serviceable in salads, being boiled and eaten with oil, vinegar, and pepper.

* *Origine des Plantes Domestiques démontrée par la Culture du Radis Sauvage*, 1869.

Salsify.

Tragopogon porrifolius, L., was cultivated much more in the sixteenth and following centuries than to-day. It occurs wild in North and Middle Europe, as well as in Greece, Dalmatia, and Italy. The name is derived from the Italian word *sassefrica*, evidently the same as *saxifraga*.

The sixteenth-century botanists all describe the goat's-beard (*T. pratensis*, L.) and refer to the Greek names *Tragopogon* and *Comē*, and the Latin *Barba hirci*. Dodoens has a figure and adds:

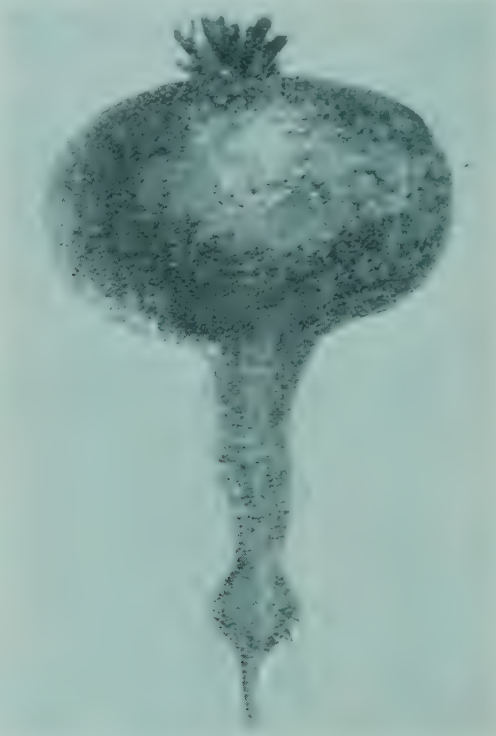

Fig. 124.—Turnip Form of Radish raised by M. Carrière from the Wild Radish.

"There are two kinds, one yellow, the other with a purple flower" (1559). Gerard appears to be the first to figure the salsify as *T. purpureus*, purple goat's-beard. He describes both species as having the same medicinal virtues. With regard to the use as a vegetable, he says of the roots: "Boiled in water untill they be tender, and buttered as Parsnips and Carrots are a most pleasant meate and wholesome, in delicate taste farre surpassing either Parsnip or Carrot." Gerard observes though not wild in England it was cultivated "in gardens for the beautie of the flowers, almost every where."

Scorzonera.

Scorzonera hispanica, L., or viper's grass, was introduced from Spain in 1576, and Gerard appears to be the first writer who alludes to it. He says: "Viper's grasse is called of the Spaniards *Escorzonera*, which soundeth in Latine *Viperaria*, or *Viperina*, or *Serpentaria*, so

called because it is accounted to be of force and efficacie against the poisons of Vipers and Serpents, for *Vipera*, or a viper, is called in Spanish *Scurzo*. In English we may call it Scorzoner after the Spanish name, or Viper's Grasse."

Parkinson, writing in 1640, says of it: "The roote is as thicke as three fingers or more, but much shorter than in any other kinds [of Scorzonera; he describes six in all], blackish without, and somewhat whitish within, yeelding very little milke, when it is broken." The plant is said to be "wild in Europe, from Spain, where it abounds, the South of France, and Germany, to the region of the Caucasus, and perhaps even as far as Siberia, but it is wanting in Sicily and Greece. In several parts of Germany the species is probably naturalized from cultivation." *

With regard to the use of the root the following has been given as to its esculent and medicinal values. "The taste is sweetish and agreeable, something like that of the roots of certain umbelliferous plants or the common hazel-nut, and a variety with a paler skin has a still more agreeable flavour. Its effects on the digestive organs are to increase the flow of gastric juice and bile. It is said that its antibilious power is scarcely inferior to that of dandelion, and it is on this account one of the best remedies in cases of indigestion. These good effects, however, cannot be insured unless the root is properly cooked, as its medicinal qualities may be quickly destroyed. It should be cut as little as possible, and washed, *not* scraped, as the abundant milky juice, on which its salutary properties depend, then escapes. After boiling for about twenty or twenty-five minutes, or till it is quite soft (rather more salt being added to the water than usual in cooking vegetables), it is to be taken out and peeled, as the dark skin then comes off as readily as that of a boiled potato. When fresh from the garden a quarter of an hour may be sufficient, which is of some importance to the invalid to know; because after it has become quite soft all further boiling is injurious to its medicinal qualities, and soon destroys them; but when it has lain out of the ground for a long time and become hardened, it may require twice the time to boil—the rule then is, *to boil until it be soft.* It is usually eaten in the same way as asparagus, which is the preferable mode for the invalid. It is one of the most agreeable of vegetables in point of flavour." †

This root shows very well how a drug-plant passed into a culinary vegetable; such being the origin of many of the latter.

Skirret.

This name has been applied to the Greek *Sisaron* and the Latin *Siser* or *Sisarum*; but Linnaeus placed it under the genus *Sium* as *S. Sisarum* (eighteenth century). In the fourteenth century "Skirwhit" and "Baucea" were both applied to the wild Parsnip. The first question is, What did the ancients mean by *Siser* or *Sisarum*? Sisaron

* *Origin of Cultivated Plants*, A. de Candolle, p. 44.
† *Treasury of Botany*, s.v. p. 1041.

is first mentioned by Epicharmus, a Syracusan poet, 500 B.C. Pliny (first century) says "the wild *Sisarum* is very like the cultivated kind," and attributes certain medicinal virtues to it, equally applicable to the parsnip. As an edible vegetable, Pliny says that "it had its reputation established by the Emperor Tiberius, who demanded a supply of it every year from Germany. It is at Gelduba, a fortress situate on the banks of the Rhenus, that the finest are grown, from which it would appear that they thrive best in a cold climate." He then adds a feature which at once distinguishes the *Siser* from the modern skirret. "There is a string running through the whole length of the skirret, which is drawn out after it is boiled." This string is characteristic of many wild roots, but is not in the cultivated ones. Moreover, he implies a single root, not a cluster of small ones, which the true skirret of to-day has. Pliny then proceeds: "Still, for all this [*i.e.* boiling it] a considerable proportion of its natural pungency is retained. . . . The larger parsnip has also a similar string inside, but only when it is a year old." When speaking of the *Pastinaca* or Parsnip, he makes the same remark that after being cooked "it is found quite impossible to get rid of the pungent flavour."

Coming to the sixteenth century, Matthiolus, in his commentary of Dioscorides (1574), figures the modern skirret with numerous knotted roots, and leaves very like those of a parsnip, under *Siser*, but adds a second kind which represents the Carrot. He confesses that "it is most difficult to show what the true and legitimate *Siser* was."

Dodoens (1559) had already figured the skirret as the *Siser* of Pliny, and says it was known to the herbalists as *Serulum*, *Seruilla*, or "chervil." This name perhaps arose by mistake from some resemblance of the foliage to that of the true Chervil (*Cerefolium*). In France it was then, and still is, called "chervis."

Dodoens, in describing the skirret, says the leaves resemble those of the parsnip, with "seeds somewhat broad." That would apply to the Parsnip; but he adds, "but the Skirwirt that groweth in my garden hath a little long crooked seede." This agrees with the seed of the true skirret. He finally adds: "The roots are white, of a finger's length, divers hanging together." He thus seems to blend the parsnip with the true skirret, or *Sium Sisarum*.

Lobel, in his "History of Plants" (1756), figures the skirret as having numerous tuberous roots and leaves like those of the parsnip, as *Sisarum*, adding the Spanish name *Cherivia*. He describes the taste as like, but more pleasant than, that of parsnips.

Gerard (1597) figures *Sisarum*, and calls it "Skerrets."

With regard to the country whence the skirret came, none of the sixteenth-century herbalists appear to know. Gerard only observes that it was cultivated in gardens. He seems to think it was the same plant as Pliny's *Sisarum* or *Siser*, for he says: "This is that *Siser*, or Skirret, which Tiberius commanded to be conueied vnto him from Gelduba."

Lastly, Bauhin (1672) still regarded *Sisarum* as identical with the Roman plant.

The conclusion to be drawn from the above doubtful notices is that *Siser* and *Sisarum* were Roman names for some variety of parsnip, and that the true skirret was unknown before the sixteenth century.

To come to more modern days, Tournefort, in his "Compleat Herbal" (1719), figures the skirret with numerous spindle-shaped roots, and says he knows but one species, *Sisarum Germanorum*, which Caesalpinius had regarded as synonymous with *Elaphoboscum* (fifteenth century). But as it has "white umbels of sweet-smelling flowers," it could not be the parsnip.

Linnaeus, in 1754, is the first to cast doubts upon the origin of the skirret. He includes it under the genus *Sium*, one species of which, *S. latifolium*, is our British water parsnip, resembling the parsnip in foliage, but it is not edible, being slightly poisonous. Linnaeus, however, adopted the old Latin name *Sisarum* as specific, but adds, "*Habitat* in China."

Alphonse de Candolle, in his "Origin of Cultivated Plants," discusses the question of the origin of the skirret, but thinks it doubtful as a native of China, observing that Maximowicz recognizes only the Altaic region of Siberia and North of Persia as the home of the wild *Sium Sisarum*, L. He observes: "It came, perhaps, from Siberia into Russia, and thence into Germany. . . I cannot find any Russian name, but the Germans have original names, Krizel or Grizel, Görlein or Gierlein, which indicate an ancient cultivation, more than the ordinary name Zuckerwurzel or sugar-root. The Danish name has the same meaning—*sokerot*, whence the English Skirret."

MM. A. Paillieux and D. Bois in "Le Potager d'un Curieux: Histoire, Culture et Usages," observe that Jacques and Hérincq give the date 1548 for the introduction of the chervis or skirret into Europe. If so, then the date of Dodoens' figure 1559 and the several countries in which he says it was then cultivated (unless it be confounded with the parsnip) would seem to indicate too short a time for its diffusion. The mystery of its origin and introduction, therefore, still remains unsolved.

The Turnip and the Rape.

These two plants are only different forms or varieties of the same species known as *Brassica campestris*, L. (fig. 125)—*B. Napus*, L. (?), being the Rape; *B. Rutabaga*, L., the Swede; *B. Rapa*, L., the globular Turnip and the spindle-shaped Navew. Another variety is called *oleifera*, the seeds of which supply rape and colza oils.

Both kinds were well known to the ancients. The Greeks had two words *Gongulē*, which was the turnip, for the word means "round," and Aristophanes speaks of *Gongulē memagmenē*, which may be translated "mashed turnips." Theophrastus and Dioscorides have the name *Bounias*, which was recognized in the sixteenth century as the rape and called *Napus sativus*; but someone has written in MS. of that century, "The little Navew."

Pliny regards the rape and turnip as the same, for he observes: "The Greeks have distinguished two principal species of rape, the male and the female, and have discovered a method of obtaining them both from the same seed; for when it is sown thick, or in a hard, cloggy soil, the produce will be male." Elsewhere he distinguishes the forms, saying: "Medical men call those which are round 'male,' while those which are more elongated are known as 'female' rape; the last are superior in sweetness, and better for keeping, but by successive sowings they are changed into male rape." It is clear that the male is the "turnip" and the long-rooted the "rape."*

Fig. 125.—Wild Turnip (*Brassica campestris*).

Dodoens calls the turnip the "round rape," but adds a chapter on the "long rape," or navew, of which "there are two sorts, tame and wilde." These correspond to his plates of *Napus sativus* and *Napus sylvestris*. "The roote of the Navew gentle or garden long Rape is very long and thicke, in all things else like the Turnep or round Rape." He adds: "The Navew gentle is much sowen in France, especially about Paris" (1559).

Turner repeats the above and adds: "The long-rooted rape groweth very plenteously a little from Linne, where as much oyle is made of the sede of it" (1568). Besides supplying oil, Gerard adds that the seed "feedeth singing birds" (1597).

With regard to field turnips, Mr. Macdonald says: "It appears to have been brought over from Holland and grown on the Marquis

* The reader is referred to the Radish and Carrot for similar instances of change of form, according to the stiffness or looseness of the soil.

Townshend's estate at Rainham, Norfolk, in 1730. . . . It has been evolved from the common rough-leaved rape, with no semblance of a bulb." Several varieties existed at the beginning of the nineteenth century, such as the White-fleshed from Flanders, and the Yellow-fleshed, probably derived from the Yellow Tankard, but altered by cultivation. The Swede was first introduced into Scotland in 1781, and called "Ruta Baga" at Gottenberg, whence the seed was sent, and supposed to have originated from the smooth-leaved rape.

With regard to the value of the turnip, Prof. Church writes: "The turnip, like many others of the same family, contains a pungent essential oil. The root is very watery and contains but little nourishment. It has no starch but, instead, a jelly-like matter (pectose). Turnips contain no more than ·5 per cent. of flesh-formers." The proportions are nearly 93 per cent. of water, and "pectose" 3 per cent. The nutrient ratio is 1:6; the nutrient value not quite 4.

(To be continued.)

THE EFFECT OF THE FROSTS OF THE WINTER OF 1908-9 ON VEGETATION.

Compiled by F. J. CHITTENDEN, F.L.S.

THE winter of 1908-9 was marked, particularly in the south-east of England, by two spells of severe weather, which, though of short duration, did a considerable amount of damage, particularly to woody plants, even such hardy natives as furze and broom suffering severely in some places.

The hardiness of shrubs and trees in our climate is always of interest, and particularly at the present time, when the value of shrubs in garden decoration is becoming more and more recognized, and numbers of new, beautiful, and untried plants are coming to us from inland China and Tibet, as well as from other parts of the world.

Records* of the behaviour of introduced plants towards low temperatures in this country are, for the most part, scattered in periodical literature, and are too often of little use because the temperatures are not given, or, when given, the manner of obtaining the temperature values is not recorded, and other conditions which influence the behaviour of the plants are not noted at all.

It was therefore suggested by the Scientific Committee of our Society that records of the damage done by these winter frosts should be collected, and to this end the following letter, schedule of questions, and forms were drawn up and circulated:—

Royal Horticultural Society's Laboratory,
Wisley, Ripley, Surrey.
April 1909.

DEAR SIR,—In view of the great severity of the weather in the past winter (1908-9) in certain parts of the country and the large number of new plants recently introduced to our gardens, it is desirable to collect all available information concerning the damage done by frost in order that it may be made public in the Royal Horticultural Society's Journal.

Will you, therefore, be so good as to fill in the forms sent herewith and return them to me at your convenience? Additional forms will be sent with pleasure if required.

No doubt the extent of the damage done will not be apparent until the middle or end of May, but may we be allowed to suggest that notes

* Attention may be drawn to the reports on this subject published in the Journal of the Society from time to time, and especially to the masterly report on the winter of 1837-8 by Dr. John Lindley, F.R.S., in *Trans. Hort. Soc.*, 2nd series, vol. ii. (1835-1841), pp. 225-715, and the "Frost Report," by Rev. George Henslow, M.A., F.L.S., V.M.H., forming vol. viii. (1887) of the *Journal of the R.H. Society*. See also *Kew Bulletin*, 1896, p. 5.

of the apparent damage should be made at once and checked subsequently at the time the plants should be in full growth?

In some cases it will be impossible to answer all the questions, but any exact information that can be given will be of immense service in drawing up the report and will be of great value to the Fellows of our Society.

Yours truly,

FRED. J. CHITTENDEN.

FORM A.

SCHEDULE OF QUERIES.

1. Locality of garden.

2. Height above sea-level.

3. Is the surrounding country open or is the garden sheltered by hills, &c.?

4. Is there any large body of water near?

5. Has the garden suffered any great damage from frost during the winter of 1908-9? If possible, please say how the amount of damage compares with that experienced in previous severe winters.

6. What were the lowest temperatures recorded during the winter, with dates?

(1) On Grass.
(2) In Screen.

If the thermometers are placed in positions other than these, please give exact situation and exposure.

7. Have the thermometers been verified at Kew?

8. If not, are the thermometers ordinary minimum thermometers or "Six's"?

9. How do the temperatures compare with those experienced during other winters?

10. How long did the frosts last?

11. Was snow on the ground at the time? If so, about how much?

12. What was the general character of the autumn months in the district?

13. What is the nature of the soil and sub-soil?

14. Please give any further particulars regarding the climatic conditions that you think may be of service in drawing up the report.

Name.....

Form B.

LIST OF PLANTS INJURED BY FROST DURING WINTER 1908-9.

1 Name of Plant	2 Approximate Age	3 Situation with regard to Exposure *	4 How long Planted in this Situation	5 Extent of Damage *	6 Remarks

* The following abbreviations may be convenient :—

Column 3.—N = exposed on north ; S = south ; W = west ; E = east ; X = sheltered all round ; Y = wet at roots ; Z = dry.

Column 5.—A = killed outright ; B = killed to ground level ; C = much injured ; D = slightly injured

FORM C.

LIST OF NEWLY INTRODUCED PLANTS WHICH CAME THROUGH WINTER OF 1908-9 UNINJURED.

1 Name of Plant	2 Approximate Age	3 Situation with regard to Exposure *	4 How long Planted in this Situation	5 Remarks

* The following abbreviations may be convenient :—

Column 3.—N = exposed on north ; S = south ; W = west ; E = east ; X = sheltered all round ; Y = wet at roots ; Z = dry.

This request met with a ready response, and a large number of forms were returned containing a vast amount of information. A partial list of these returns is given at pp. 364-366, but this includes only those containing the larger numbers of records. We desire here to tender our thanks to all the compilers of returns, whether mentioned in that list or not, who have thus enabled us to put the information contained in the following account before the Fellows of our Society.

The amount of damage recorded in many of the returns is greater than that experienced in any winter since 1894-5, though this is true chiefly of the South-Eastern counties. In those more westerly a greater amount of damage had been suffered in the previous winter.

The nature of the weather generally will be gathered from the following note drawn up by Mr. R. H. Curtis, F.R.Met.Soc.:—

"The weather of the four days December 27-30 was very inclement over the whole of Great Britain, but not so to any unusual degree in Ireland. The cold was accompanied by a good deal of snow, which in many districts became swept by the strong winds which prevailed into deep drifts, and as such, may have had a considerable influence upon vegetation. The cold snap followed very suddenly upon the uniformly mild weather, which had been the noticeable feature of the preceding days of the month, and during most of the interval the temperature did not rise in many districts much above 20 degrees. The cold was most severe over the Midland and South-Eastern counties of England, the lowest temperatures occurring as a rule on the 29th or 30th. In Scotland the cold was less severe, and, except in a very few instances, the screen minimum did not fall below 20 degrees, while in the English Midland, Eastern, and South-Eastern counties readings only a few degrees above zero Fahrenheit were observed in many places, and even at Jersey the minimum in the screen fell to 27 degrees.

"The second spell of exceptional cold occurred during the opening days of March, and was more widely felt, but was again accompanied by cold rain, snow, and hail, the falls of snow being deep in some parts of the country. The greatest cold was, however, again felt over the South-Eastern counties of England, where screen minima at, or not many degrees above, zero were registered at several places. In the Eastern portion of Scotland it was low, except near the coast; but minimum temperatures ranging at a few degrees above or below 20 degrees were recorded nearly everywhere south of the Highlands, the patch of more severe cold being, roughly speaking, confined to the South and South-east Midlands.

"In both of these cold periods it is important to note that not only were the minima low, but the low temperatures were persistent, and at many places throughout the periods the temperature remained below the freezing-point."

* * * * * * *

The lack of uniformity in making temperature records is commented upon by Mr. Curtis in a note which we append, and this lack is greatly to be regretted, as it makes exact comparisons between different localities impossible, and accounts for some of the apparent differences in behaviour noted in the returns.

Another factor making comparisons difficult is the very considerable range of temperatures found within quite small areas at different elevations, sometimes amounting to several degrees. This last factor it is practically impossible to eliminate in returns of this kind, though the former disturbing factor is capable of remedy. .

Mr. Curtis says:—

"The value of temperature observations in such a discussion as the present depends entirely upon their being so made that they shall be perfectly comparable with each other, otherwise it may very well appear that in one locality plants have been able to withstand a temperature considerably below that at which similar plants have succumbed in another, and in such a case the à priori explanation would be not that the instruments had been incorrectly read, but that from some cause the temperature shown by the thermometer at one of the two places was erroneous.

"The observations supplied in response to the circular in the present case emphasize this point and show the desirability of using verified thermometers of standard type, and also the necessity for exposing them under similar conditions. In some instances the observations were made from instruments exposed in 'screens,' but the *kind* of screen is not stated; in others the thermometer was exposed upon a post; and in yet other instances upon a wall, and in each of these exposures there are several factors such as height above ground, the character of the wall, and especially the aspect, which would materially influence the indications of the instrument. A thermometer placed four feet above the ground in a double screen may not—and, indeed, frequently does not—indicate the temperature which an instrument freely exposed to terrestrial radiation would show, or that to which vegetation would be subject close to the ground; but the observations would be comparable with each other, and would enable a far juster view to be obtained of the distribution of cold or heat over a district than could be got under other circumstances. The description of the instrument which was used is also in several cases vague, and the term 'ordinary' applied to the thermometer may convey a different meaning to different people."

* * * * * * *

The following is a list of the localities most frequently referred to in the following notes, with some particulars concerning each, including the minimum temperature recorded during the winter so far as it is available in each case:—

Locality	Height above sea	Situation with regard to shelter	Lowest temperature		Records made by
			In screen or on post	On grass	
	Feet		Degrees	Degrees	
*Abbotsbury Castle, Dorset	100	Sheltered by trees	16	14	Mr. H. Kempshall.
Aldenham, Elstree, Herts	305	Sheltered by hills	?	?	The Hon. Vicary Gibbs.
Aldersey Hall, Cheshire	50	Open	2	?	Hugh Aldersey, Esq.
Alloa (Kennet Gardens), N.B.	20–50	Rather open	?	12	Mr. J. J. Mann.
Aston Rowant, Wallingford, Oxford	350	Sheltered by hills and trees	?	?	Mr. G. Abbey.
Ayrshire S. . . .	120	Sheltered by hills	10	?	Mr. D. Buchanan.
Belsay Castle, Northumberland	410	Sheltered by hills	?	?	Sir A. E. Middleton, Bart.
Belvoir Castle, Lincs .	200–460	Sheltered by slope of hill and by trees	10	6	Mr. W. H. Divers, V.M.H.
Bettws-y-Coed, Carnarvonshire	70–120	Sheltered by hills	20	?	E. C. Buxton, Esq.
Brodie Castle, Forres, N.B.	100	Open, with some wood	4	?	Brodie of Brodie.
Brympton House, Yeovil, Somerset	124	Open, with some wood	5	?	Mr. W. Hobby.
Burford, Surrey . .	145	Sheltered from east	5	3	Sir Trevor Lawrence, Bart., V.M.H.
Byfleet, Surrey . . .	65	Open	?	−1	Mr. G. Carpenter.
Camberley, Surrey . .	380	Open	8	4	Dr. Hugo Muller.
Cambridge Botanic Garden	40	Open	7	?	Mr. Irwyn Lynch, M.A., V.M.H.
Chelmsford School of Horticulture, Essex	100	Rather open	1	?	Mr. C. Wakely.
Chelsea Physic Garden, London, S.W.	36	Sheltered by trees	16	?	Mr. W. Hales.
Clapham, Yorks . .	500	Open	?	?	R. J. Farrer, Esq.
Cobham, Surrey . .	70	Rather open	5	3	Canon W. L. Grane, M.A.
Colwyn Bay, Nantyglyn Hall, N. Wales	285	Sheltered on N. by trees	8	?	Mr. J. E. Hanmer.
Corstorphine, Edinburgh	350	Sheltered by hills	12	?	R. Lindsay, Esq.
Crawley, Tilgate Forest Lodge, Sussex	411	Sheltered	8	?	C. G. A. Nix, Esq.
Dartmouth, Devon . .	50	Sheltered. Near sea	25	?	S. W. Fitzherbert, Esq.
Dumfries (Newton House), N.B.	75	Sheltered by trees	?	?	G. F. Scott-Elliot, Esq.
Enfield, Myddelton House, Herts	200	Open	?	−1	E. A. Bowles, Esq.
Epping, Copped Hall, Essex	200	Sheltered by hills	9	?	Mr. A. Bullock.

* The portion of the name printed in capitals is used to designate the place throughout the notes which follow.

Locality	Height above sea	Situation with regard to shelter	Lowest temperature		Records made by
			In screen or on post	On grass	
	Feet		Degrees	Degrees	
Filleigh, N. Devon . .	317	Sheltered	13	?	Mr. E. E. Bristow.
Foots Cray, Kent . .	110	Open on N.	?	1	C. E. Shea, Esq.
Gunton Park, Norwich .	150	Sheltered by woods	?	?	Mr. W. Allan.
Harpenden, Herts . .	380	Open	8	13	A. D. Hall, Esq., F.R.S.
Harrow Weald, Middlesex	490	Sheltered by woods	14	?	A. Kingsmill, Esq.
Haslemere, Surrey . .	500–600	Sheltered by woods	16	?	B. E. C. Chambers, Esq.
Hayling Island, Hants .	15	Exposed. Near sea.	8	?	Col. J. G. Sandeman.
Hever Castle, Kent .	85–140	Exposed to E. and W.	6	?	Mr. H. R. Whitelaw.
Hinton Admiral, Hants .	150	Sheltered by trees	6	?	Mr. E. Dumper.
Hornby Castle, Lancs .	140	Sheltered by hills and trees	20	?	Mr. W. Wadds.
Horsham, Warnham Court, Sussex	230	Sheltered on W.	4	?	C. J. Lucas, Esq.
Hythe, Kent . . .	200	Open to S. Near sea	12	6	Rev. T. A. Hyde.
Isleworth, Middlesex .	24	Sheltered by trees	10	?	A. Worsley, Esq.
Kew, Surrey . . .	60	Varies	10	?	Mr. W. J. Bean.
Killerton, Broadclyst, Devon	160	Sheltered on N.; open elsewhere	12	?	Mr. J. Coutts.
Lamberhurst, Bayham Abbey, Kent	250	Sheltered	8	?	Mr. W. Earp.
Monreith, N.B. . .	120	Sheltered by woods	18	9	Sir Herbert Maxwell, Bart.
Mowbray Park, Sunderland, Durham	120	Open	15	?	Mr. W. Hall.
Newbury, Berks . .	240	Open	?	?	H. C. Davidson, Esq.
North Mymms, Herts .	?	Open	5	?	Mr. C. R. Fielder.
Nuneham Park, Oxford .	280	Open to S. and S.W.	13	?	Mr. C. E. Munday.
Osterley Park, Middlesex	86	Sheltered by trees	8	?	Mr. J. Hawkes.
Osmington, Weymouth, Dorset	100	Sheltered by hills Near sea	?	?	Mrs. A. K. Shepherd.
Poolewe, N.B. . . .	30	Near sea	22	?	O. Mackenzie, Esq.
Powis Castle, Welshpool, Mont.	305–485	Open to S.E.	6	?	Mr. J. Lambert.
St. Keverne, Lanarth, Cornwall	300	Sheltered by woods	24	?	P. D. Williams, Esq.
Slough, Bucks. . .	100	Open	11	2	A. Turner, Esq.
Stisted Hall, Braintree, Essex	172	Sheltered by woods	10	?	C. S. Montefiore, Esq.
Stoneyford, Kilkenny, Ireland	300	Sheltered by trees	13	?	Mr. J. Stark.
Strathfieldsaye, N. Hants	170	Sheltered by woods	?	?	Rev. F. Page-Roberts.
Studland, Dorset . .	70	Rather open	16	?	A. D. Michael, Esq.
Sutton Place, Surrey .	147	Fairly open	6	?	Mr. J. Goatley.

Locality	Height above sea	Situation with regard to shelter	Lowest temperature		Records made by
			In screen or on post	On grass	
	Feet		Degrees	Degrees	
Tamworth, Elford Hall, Staffs	183	Sheltered by trees	10	?	Howard Paget, Esq.
Tetbury (Westonbirt), Gloucester	400	Open	?	6	Mr. A. Chapman.
Thetford, Norfolk . .	100	Sheltered by woods	5	?	S. Morris, Esq.
Tortworth, Gloucester .	264	Open	12	?	Mr. G. A. Banting.
Waltham, Warlies, Essex	150	Sheltered by hills	?	?	Sir J. F. Buxton, Bart.
Whitby, Mulgrave Castle, Yorks	410	Sheltered by trees	17	?	Mr. J. Corbett.
Wimbledon, Surrey . .	183	Open	?	?	Professor J. B. Farmer, F.R.S.
Wisley, Surrey . .	90	Varies	7·5	−1	Mr. S. T. Wright.
Wye, Kent . .	150	Open	0	−6	C. H. Hooper, Esq.

We have dealt in the first place with the damage sustained by two or three widely cultivated groups of plants, viz. winter vegetables, bamboos, and roses; next, the plants of which we have the largest number of records are arranged alphabetically in a table (pp. 369-371) so that their behaviour during the winter may be easily ascertained; and, lastly, the bulk of the plants reported upon are arranged alphabetically under the countries in which they are native (pp. 373 *et seq.*).

I.

Winter Vegetables.—Broccoli, Brussels sprouts, and kale were all killed at Harpenden; at Foots Cray practically all the winter vegetables were killed, including kale, and the same report comes from Isleworth; broccoli were badly damaged at Wye, Lamberhurst, and Stisted Hall, but at Newbury, where the stems were bent down and covered with soil, they escaped injury, though winter spinach, lettuce ("All the Year Round"), and swedes were killed there, while autumn-sown onions showed no injury; thousand-headed kale was killed at Stisted Hall, where old residents had never known it to happen before. A point noted in several returns is that the vegetables which were most heavily manured suffered more severely than others growing beside them and not so generously treated.

Bamboos.—Speaking generally, bamboos suffered severely. For instance, Mr. Bean, writing in the *Kew Bulletin*, 1909, p. 235, says: "These [bamboos] afford the worst evidence in Kew of the winter's havoc, and the appearance of the Bamboo Garden at the time of writing (June) makes one doubt whether a large portion of the species are really worth a place in ornamental gardens. Not a single species probably has been killed or even permanently injured, but the top growth of many is entirely dead, and only the underground rhizomes

are alive. Others which on Christmas Day last constituted some of the freshest, and certainly most graceful, masses of greenery in the Gardens are now leafless stems with no more beauty than a bundle of pea-sticks. And the worst consequence of a season like the past one is that, so late are bamboos in renewing their growth, it is not until after midsummer that they become presentable again." At Burford all bamboos except *Arundinaria nitida* were much damaged, although not exposed to the east; at Wisley and Tetbury, on the other hand, most species suffered but little, a few only being made to look shabby; at Hever Castle most were killed to the ground; at Foots Cray, where they are grown in a bed surrounded by a beech hedge 20 feet in height, the same thing occurred, though there a few escaped with less injury; at Cobham and at Aldenham they are reported as severely injured; but at Horsham the damage done was less, and at Poolewe none was injured.

Turning now to the records of the various species, *Arundinaria japonica* (=*Bambusa Metake*) was either killed outright or to the ground at Sutton Place, Byfleet, and Burford; it was severely damaged at Wisley, Lamberhurst, and Chelmsford, and slightly at Kew, but escaped unhurt at Belvoir Castle and Brodie Castle, where *A. auricoma* was killed to the ground and *A. anceps* severely damaged; the last was killed to the ground at Enfield; *A. Hindsii* was badly injured in a protected bed at Cambridge, and at Burford *A. Simoni* was cut to the ground, though at Brodie Castle it was but slightly damaged; *A. falcata* was slightly damaged at Belvoir Castle; *A. nitida*, killed to the ground at Byfleet, was unhurt at Kew, Burford, and Brodie Castle; *A. pygmaea* and *A. Veitchii* suffered very little at Kew; *A. Fortunei* was severely damaged at Thetford, and *A. Falconeri* was killed to the ground at Slough; *Bambusa fastuosa* did not suffer in the least at Kew, but was killed to the ground at Enfield and Brodie Castle; *B. palmata*, and *B. tessellata* are reported uninjured from many gardens; *B. marmorea* was killed to the ground at Brodie Castle; *Phyllostachys viridiglaucescens* escaped damage at Belvoir Castle, but was damaged at Kew, though one plant on a dry bank did not suffer at all, and lost its leaves at Aston Rowant; *P. Kumasaca* and *P. aurea* were killed to the ground at Brodie Castle, but the former suffered little at Kew; *P. Quilioi* was slightly damaged at Kew and Burford; *P. flexuosa* was slightly damaged at Kew, as was *P. nigra;* the last was killed to the ground at Byfleet, but escaped altogether at Brodie Castle and in many other gardens.

Roses.—Tea and hybrid tea roses suffered greatly in many gardens, a large number being killed at Wisley (see JOURN. R.H.S. xxxv. (1909) p. 399), Cobham (especially standards), Sutton Place, Byfleet, Wye, Foots Cray, Strathfieldsaye, Harpenden, Newbury, Gisburn, and Slough, and severe damage being reported by numerous other gardens. Of the species, *Rosa laevigata* was slightly cut on a wall at St. Keverne, and the variety *major* on a west wall at Horsham; *R. sinica* 'Anemone' was unhurt in even the bleakest situations at Clapham,

but was slightly damaged on a west wall at Horsham; *R. yesoensis* was unhurt at Clapham; *R. bracteata* was killed to the ground at Enfield, and sustained considerable damage on a south-west wall at Monreith, where it has grown for twenty years, and always has its foliage scorched, but blooms profusely every year; it was only slightly damaged at Horsham on a south wall and at Harrow Weald; *R. Banksiae* had its branches severely cut in South Ayrshire; *R. Hugonis* was uninjured both at Kew and Haslemere; *R. Moyesii* suffered no damage at Burford or Haslemere, nor *R. sericea pteracantha* at St. Keverne.

II.

The plants most frequently referred to in the returns are entered in the Table on pp. 369-371, and we have not hesitated to include here and in the records which follow many common and well-known plants, for their behaviour serves in some degree as a standard against which to measure that of the less well known or newly introduced plants.

The temperature given in the top line of the Table is the minimum temperature recorded in the screen during the winter, unless otherwise stated.

In reading the records given, it should be borne in mind that those from Hythe, Slough, and Abbotsbury frequently refer to shrubs planted within the year.

References: A = killed outright; B = killed to the ground level; C = badly injured; D = slightly injured; E = unharmed. Where the sign † follows one of these letters it means the plant was growing on a wall.

* * * * * * *

The following are additional records concerning the behaviour of some of the plants mentioned in the Table:—

Abelia chinensis.—Horsham (D), Hinton Admiral (D).

Abutilon vitifolium.—Crawley (E), Killerton (E), Corstorphine (E).

Arbutus Unedo.—Horsham (E), Cambridge (C), S. Ayrshire (E), Tamworth (E).

Azara microphylla.—Belsay Castle (E), Aston Rowant (D), Hinton Admiral (D, E†), Hever Castle (B).

Buddleia asiatica.—Dartmouth (A).

B. Colvillei.—Poolewe (E), Aston Rowant (C†).

B. globosa.—Brympton (E), Horsham (E†), New Galloway (D), Aston Rowant (D), Newbury (C), Hever Castle (B), Studland (B), Tamworth (B).

B. variabilis.—Whitby (E), Chelmsford (B), Hever Castle (B).

B. variabilis var. *Veitchiana.*—Horsham (E), Thetford (C), Osterley Park (C), Strathfieldsaye (B), Wimbledon (D).

Caesalpinia sepiaria.—Thetford (D), Foots Cray (A).

Carpenteria californica.—Horsham (E), Hinton Admiral (C†, D†), Belsay Castle (D), Thetford (C), Foots Cray (A).

Caryopteris Mastacanthus.—Brympton (E), Thetford (D), Mowbray Park (D).

—	Byfleet, −1° *	Enfield, −1° *	Wisley, −1° *	Aldersey, 2°	Cobham, Surrey, 5°	Burford, 5°	North Mymms, 5°	Sutton Place, 6°	Hythe, 6° *	Camberley, 8°	Hayling Island, 8°	Belvoir Castle, 10°	Kew, 10°	Slough, 11°	Tortworth, 12°	Tetbury, 6° *	Nuneham Park, 13°	Harrow Weald, 14°	Aldenham, ?	Abbotsbury, 16°	Chelsea, 16°	Haslemere, 16°	Monreith, 18°	St. Keverne, 24°	Clapham, Yorks, ?
Abelia chinensis (= *A. rupestris*)	—	—	C	C	—	—	D	C	—	—	—	—	—	B	—	—	D	E†	C	—	—	—	—	—	A†
Abutilon vitifolium	—	A	B	—	—	—	—	—	—	—	—	C	—	—	—	—	—	—	—	—	—	—	E	—	E†
Arbutus Unedo	—	—	—	E	—	—	A, E	—	—	C	—	—	—	B	—	C	—	E	—	—	—	—	—	—	—
Azara microphylla	A, B	C	B, C	E†	A, B	—	D†	B, C	—	—	—	C	C	D	—	D	—	E†	D	—	—	—	—	—	D†
Berberis Wallichiana	—	—	C	—	—	—	—	—	—	—	—	—	D	C	—	B	—	—	B	—	—	—	—	—	—
Buddleia asiatica	—	—	—	—	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	A	—	—	—	—	—
B. Colvillei	—	—	—	—	—	—	—	—	D	C	—	—	—	—	—	—	—	—	—	—	—	D	A, E†	—	D†
B. globosa	B	B	—	—	—	—	B, D	—	—	C	—	E	C	B	—	—	—	E	—	—	B	—	E	—	—
B. variabilis	B	C	—	E†	—	—	D	—	—	—	—	A	—	B	E	D	—	E	—	—	—	—	E	E	E
B. v. magnifica	—	—	—	E	B	B	—	—	—	—	—	—	—	—	—	E	—	E	—	—	—	—	E	—	—
B. v. Veitchiana	—	D	C	E†	—	B	—	E	—	E	—	E	—	—	—	E	—	E	—	—	C, E	—	—	E†	—
Caesalpinia sepiaria (= *C. japonica*)	—	—	—	C†	—	—	—	B	—	C	—	—	—	—	E	A	—	—	B	—	—	—	—	—	E
Carpenteria californica	—	—	—	E	D†	—	—	—	D	E	—	E	—	—	E	D	—	—	B	A**	—	D†	D†	—	C†
Caryopteris Mastacanthus	—	—	—	D†	—	—	A, B	—	—	C	—	—	—	D	—	—	—	—	C	—	—	—	—	—	—
Cassinia fulvida	—	—	C	—	—	—	—	C	—	—	—	—	—	C	—	—	—	—	—	—	—	—	—	—	—
Ceanothus azureus and vars.	C†	E	D	D	—	—	D	B, C	—	C	—	E	—	—	—	—	—	D, E	D	—	—	—	—	—	—
C. Veitchianus	—	A	—	—	A	—	C†	—	—	—	—	—	D	—	—	—	—	E	—	—	—	—	—	—	—
Choisya ternata	—	—	E	E	—	—	—	—	—	E	—	E	D	—	—	—	—	—	D	—	D	—	E	—	E
Cistus florentinus	—	A	—	D	—	—	A	—	—	C†	—	E	D	—	—	—	—	—	—	—	—	—	—	—	—
C. ladaniferus	—	—	—	A, B	—	—	A	C	—	—	—	E	—	A	—	—	—	—	—	—	—	—	—	—	—
C. purpureus	—	A	—	—	—	—	—	—	—	—	—	—	—	A	—	—	—	—	—	—	—	A	—	—	—
Citrus trifoliatus	—	E	E	D	—	—	—	—	—	E	—	—	—	—	—	—	—	—	—	—	E	—	—	—	E†
Clerodendron trichotomum	—	—	D	—	—	—	D	—	—	E	—	E	—	—	—	C	—	—	D	—	E	—	—	—	—
Cordyline australis	—	B	—	—	—	—	—	—	—	—	A	—	—	—	—	—	—	A	—	D	—	—	E	—	—

For meaning of letters see p. 368.

* Temperature on grass.

** Plants facing north unhurt.

	Byfleet, −1° *	Enfield, −1° *	Wisley, −1° *	Aldersey, 2°	Cobham, Surrey, 5°	Burford, 5°	North Mymms, 5°	Sutton Place, 6°	Hythe, 6° *	Camberley, 8°	Hayling Island, 8°	Belvoir Castle, 10°	Kew, 10°	Slough, 11°	Tortworth, 12°	Tetbury, 6° *	Nuneham Park, 13°	Harrow Weald, 14°	Aldenham, ?	Abbotsbury, 16°	Chelsea, 16°	Haslemere, 16°	Moncreith, 18°	St. Keverne, 21°	Clapham, Yorks, ?
Cornus capitata	—	—	—	—	—	—	B	—	A	D	—	—	—	—	—	—	B	—	—	C	—	—	E	—	—
(= *Benthamia fragifera*)																									
Corokia Cotoneaster	—	—	B	—	—	—	B	—	D	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coronilla glauca	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cotoneaster angustifolia	A†	—	A, C	—	—	B	B	—	—	—	—	D	D	—	—	—	—	D	C, D†	—	—	—	—	—	D†
Davidia involucrata	—	—	—	—	—	E	E	—	E	—	—	—	E	—	E	—	—	—	E	—	—	E	E	—	E
Desfontainea spinosa	—	—	—	—	—	—	—	—	—	—	E	D	D	A	—	—	—	—	—	—	—	—	E	—	—
Erica lusitanica	—	E	B, C	—	—	—	D	—	—	D	D	D	D	—	—	—	—	—	—	—	—	—	E	—	—
Escallonia macrantha and vars.	—	—	B, C	—	—	—	B	—	—	B	E	E	—	—	E	—	—	D	D	—	—	D	—	—	—
Eucalyptus coccifera	—	A	—	—	—	—	A	—	—	—	B	E	—	B	—	—	A	—	—	—	—	—	E	—	—
E. Gunnii	—	—	D	—	—	—	—	—	—	—	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. urnigera	—	B	A	—	—	—	—	—	—	—	B, D	—	—	—	—	—	—	—	C	C	—	E	—	—	—
Encommia ulmoides	—	E	E	—	—	—	—	—	—	—	D	—	E	—	—	—	—	—	E	C	—	E	E	—	—
Enkianthus pinnatifolia	—	E	E	C	—	—	—	—	—	E	—	E	—	—	E	—	B	E	E	C	—	D	E	—	—
Euonymus japonicus and vars.	C	—	—	—	C	—	—	—	—	—	C	—	—	B	—	C	—	—	B	—	D	—	—	—	—
Fabiana imbricata	—	A	B	—	—	—	A	—	D	—	—	E	—	—	—	—	A†	—	—	—	—	—	D†	—	D†
Feijoa Sellowiana	—	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	B	—	—	—	—	—	E†	—	—
Garrya elliptica	—	—	—	—	—	—	D	—	—	E	—	—	—	—	—	—	—	—	D	C	—	C	—	—	D†
Grevillea rosmarinifolia	—	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	A†	—	—	A	—	C	E†	—	—
Griselinia littoralis	—	—	—	E	—	—	—	A	—	—	—	—	C	—	—	C†	—	—	—	—	—	—	—	—	—
Helichrysum diosmifolium	—	—	—	—	C	—	—	—	—	—	A	—	—	—	—	—	A	—	—	—	—	—	B, C, D	—	—
(= *Ozothamnus rosmarinifolius*)	—	—	C†	—	D†	—	D	—	—	—	—	—	—	C	—	—	—	—	—	—	—	—	E	—	—
Indigofera Gerardiana	—	—	—	—	B	—	—	C	—	D	—	—	—	C	—	—	—	E	D	—	E	—	—	—	—
Laurus nobilis	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

For meaning of letters see p. 368. * Temperature on grass.

Lupinus arboreus	—	—	B	—	—	—	—	—	—	A	—	—	—	—	—	—	—	E	—	—	—	—	—	—	—	—
Muehlenbeckia complexa	—	—	B	D	—	—	—	—	—	B	—	C	—	—	—	—	—	E	—	—	—	—	—	—	—	—
M. complexa var. *nana*	—	—	—	—	—	—	—	C†	—	E	—	—	—	—	—	—	—	E	—	—	—	—	—	—	—	—
Myrtus communis	—	—	—	—	—	—	—	—	—	C	—	C	—	—	—	—	—	B	D	A	—	D**	D†	—	B	—
Nandina domestica	—	C, D	—	C, D	—	D	D	—	—	E	—	—	—	—	—	—	—	—	—	—	—	—	E	—	D	—
Olearia Haastii	—	C	A, B	—	—	B	B, E	B	—	—	D	E	—	A	—	D	—	—	—	—	—	—	—	—	E	—
O. macrodonta	—	—	—	—	—	B	—	—	—	B	—	—	—	—	—	—	B	E	B	—	—	—	E	—	—	—
O. nitida	—	—	—	—	—	—	—	—	—	B	—	—	—	—	—	—	A	—	A	—	—	—	B, C	—	E†	—
O. stellulata	—	A	A, B	B, C	—	A	A	—	—	B	—	—	—	A	—	—	B	B	B	—	A	—	E	—	D†	—
Passiflora caerulea	B†	—	—	—	C†	—	—	—	—	—	—	—	—	D	—	—	A†	—	—	—	D	—	—	—	—	—
Phlomis fruticosa	—	A, B	D	B	—	—	C	—	—	B	—	D	—	—	—	—	—	—	—	—	A	—	—	—	—	—
Phormium tenax	—	—	C	—	—	—	—	—	—	—	—	E	—	C	—	—	—	—	—	C	—	—	—	—	—	—
Photinia serrulata	—	—	—	—	—	—	D	—	—	—	—	E	—	—	—	—	—	—	D	—	—	—	—	—	—	—
Pinus insignis	—	—	—	—	—	—	—	—	—	—	—	—	D	—	—	D	—	—	—	—	—	—	—	—	—	—
Plagianthus Lyallii	—	—	—	—	—	—	—	—	E	—	—	—	B, E†	—	—	—	—	—	—	—	—	—	—	E	—	—
Punica Granatum	—	—	—	—	—	—	—	—	E†	B	—	E	—	—	—	—	—	—	—	—	E†	—	—	—	—	—
Quercus Ilex	—	—	—	—	—	—	D	—	—	—	—	—	D	—	—	—	—	—	D	—	—	—	—	—	—	—
Raphiolepis ovata	—	—	—	—	—	—	—	B	—	—	—	D	E	—	—	—	—	E	—	—	—	—	—	—	—	—
Rhododendron racemosum	—	—	E	—	—	—	D	—	—	—	—	—	—	—	—	—	—	E	—	—	—	—	—	—	—	—
R. Thompsonii	—	—	E	—	—	—	—	—	—	—	—	E	E	—	—	—	—	E	—	—	—	—	—	—	—	—
Romneya Coulteri	—	—	E	—	—	—	—	—	—	E	—	E	—	—	—	—	—	E	—	—	E	—	—	—	E	—
Rosmarinus officinalis	—	—	—	—	A	—	—	—	—	—	—	D	A†	—	—	—	—	—	—	—	—	—	E	—	C†	—
Senecio Clivorum	—	—	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	E	—	—	E	—	—
Solanum crispum	—	B†	—	—	B	—	B	—	D	C†	—	—	—	—	—	—	—	E	—	—	C, D	—	E†	—	E†	—
S. jasminoides	A†	—	—	A†	—	—	A†	B†	—	A†	—	—	—	B	—	—	B†	—	B	—	—	B	E†	—	—	—
Sophora tetraptera	—	A	—	—	—	—	D†	—	—	—	—	—	A, D†	—	E	—	—	—	—	—	—	—	D, E†	—	—	—
Spartium junceum	—	—	C	D	—	—	C	A, B	—	—	—	—	—	—	—	—	—	—	C	—	—	—	—	—	—	—
Ulex europaeus	—	—	B, C	—	—	—	—	B	—	—	—	—	—	—	—	—	—	—	D	—	—	—	—	—	—	—
Veronica salicifolia	—	—	B	B	—	—	—	—	—	C	—	E	—	A	—	—	—	—	—	—	—	—	—	—	—	—
V. Traversii	—	A, D	C	—	—	—	—	—	—	C	—	E	A§	A	—	—	—	—	—	—	—	—	—	—	E	—
Viburnum Carlesii	—	—	—	—	—	E	—	—	E	—	—	—	E	—	—	—	—	—	—	—	—	E	—	E	—	—
V. rhytidophyllum	—	—	—	—	—	D	E	—	—	—	—	—	E	—	—	—	—	—	—	—	—	E	—	E	—	—
V. Tinus	C	—	—	E	B	—	D	—	—	—	—	—	—	C	—	D	—	—	C	—	—	—	—	—	—	—
Xanthoceras sorbifolia	—	—	E	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	—	—	E	—	—	—	E	—

For meaning of letters see p. 368.

** Small-leaved variety uninjured.

§ Young plants scarcely damaged.

Cassinia fulvida.—Alloa (E), Mowbray Park (D), Chelmsford (C).

Ceanothus azureus vars.—E. Sutherland (E), Horsham (D), Chelmsford (D), Brympton (B), Hever Castle (B), Osterley Park (A), Alloa (E†).

C. Veitchianus.—Hever Castle (D), Horsham (D), Wimbledon (C), Aston Rowant (A†).

Choisya ternata.—Many other records, usually of but slight injury.

Cistus ladaniferus.—Harpenden (E), Tamworth (B), Foots Cray (A), Hever Castle (A).

C. florentinus.—Epping (C), Thetford (A).

C. purpureus.—Hever Castle (A), Epping (C).

Clerodendron trichotomum.—Studland (A); other records (D or E).

Cordyline australis.—Studland (C), Isleworth (A).

Cornus capitata.—Horsham (D†), Poolewe (E).

Corokia Cotoneaster.—Thetford (C).

Coronilla glauca.—Killerton (E), Chelmsford (A), Cambridge (A†).

Cotoneaster angustifolia.—Hinton Admiral (D), Belsay Castle (C), Thetford (B), Chelmsford (B).

Davidia involucrata.—All records state the plant was unharmed.

Desfontainea spinosa.—Belsay Castle (E), Colwyn Bay (E), Clackmannan (E), Killerton (E), Thetford (A), S. Ayrshire (A), Horsham (D†).

Erica lusitanica.—Killerton (C).

Escallonia macrantha.—S. Molton (D), S. Ayrshire (D), Colwyn Bay (C), Alloa (C), Wye (B).

Eucalyptus coccifera.—Osterley Park (A).

E. Gunnii.—Corstorphine (E), Whitby (D), Belsay Castle (A), Horsham (E).

Eucommia ulmoides.—Cambridge (E), Horsham (E).

Eucryphia pinnatifolia.—Colwyn Bay (E), Killerton (E), Horsham (E).

Euonymus japonicus and vars.—More or less injured in many places.

Fabiana imbricata.—Horsham (C).

Feijoa Sellowiana.—Killerton (D†).

Garrya elliptica.—Injured in several localities, but Horsham (E†).

Grevillea rosmarinifolia.—Hinton Admiral (C), Horsham (A†).

Griselinia littoralis.—Mowbray Park (D), Horsham (B).

Helichrysum diosmifolium.—Hinton Admiral (C), Chelmsford (B).

Indigofera Giraldiana.—Osterley Park (A).

Laurus nobilis.—Hever Castle (A), Foots Cray (A), and many records of severe injury.

Lupinus arboreus.—Horsham (C), Thetford (B), Hever Castle (A).

Muehlenbeckia complexa.—Hinton Admiral (C on north wall, D on south wall), Thetford (B), Lamberhurst (A), Horsham (B); var. *nana* Horsham (E).

Myrtles were more or less damaged in most places.

Nandina domestica.—Hinton Admiral (E), Aston Rowant, in a damp place (D).

Olearia Haastii.—Alloa (E), and many records of severe injury; all bushes at Lamberhurst suffered, but those with a north exposure were killed.

O. macrodonta.—Thetford (B).

O. stellulata.—Alloa (E), Weymouth (B, C), Hinton Admiral (C), Epping (A), Chelmsford (A).

Passiflora caerulea.—Killed in several places.

Phlomis fruticosa.—Horsham (C).

Phormium tenax.—E. Sutherland (E), Thetford (D), Epping (C, D), Hever Castle (C), Hinton Admiral (C, D).

Photinia serrulata.—Hinton Admiral (A).

Pinus insignis.—Cambridge (D), Osterley Park (C), S. Ayrshire (C).

Plagianthus Lyallii.—Horsham (E †), Killerton (E).

Punica Granatum.—Brympton (E), Horsham (C†), Welshpool (A).

Quercus Ilex.—Isleworth (D), Wye (A).

Rhododendron racemosum.—Killerton (E), Thetford (D).

Romneya Coulteri.—All records say "uninjured."

Rosmarinus officinalis.—Belvoir Castle (D), Hever Castle (A), Waltham (A).

Senecio Clivorum.—All records say "uninjured."

Solanum jasminoides.—Killed to the ground or completely in all instances.

S. crispum.—Dumfries (A).

Sophora tetraptera.—Horsham (E†).

S. grandiflora.—Monreith (E).

Ulex europaeus.—Much injured (C) in many localities.

Veronica salicifolia.—Colwyn Bay (A with north-west exposure, C with south-east), Hinton Admiral (C), Mowbray Park (A).

V. Traversii.—More or less severe injury reported from many localities.

Viburnum rhytidophyllum.—Uninjured in many localities.

V. Tinus.—Slightly injured in most places.

Xanthoceras sorbifolia.—Horsham (E).

III.

The remainder of the records we have arranged alphabetically under the districts in which the plants are native. It, of course, often happens that the geographical range of the plant is greater than through one district, and in these cases there will be some overlapping, *e.g.* some plants entered in the list as belonging to the Himalayan region will also range into China, and others into Burma, and *vice versâ*. The districts are also often too large, but our knowledge of the range of plants is still very incomplete and a considerable amount of botanical exploration remains to be done, so that a further subdivision was not deemed advisable. The arrangement, however, shows to some extent from what districts hardy plants generally come, though no hard and fast rule can be drawn.

AUSTRALIA.

Acacia armata and *A. cultriformis* (young plants) were killed in the open at Abbotsbury, but only slightly injured on a wall at St. Keverne; *A. cuneata* was killed at Abbotsbury; at Hayling Is. *A. dealbata*, six years old, planted under trees, was killed to the ground, but was uninjured at Poolewe, and at Abbotsbury large plants, twelve years of age, passed safely through the winter; at Abbotsbury young plants of *A. longifolia* (standards, five years old, slightly injured at St. Keverne), *A. stenophylla*, *A. teretifolia*, *A. trinervis*, and *A. verticillata* were all killed, as was *A. lophantha* at St. Keverne, but at Killerton the Tasmanian *A. Riceana* was quite uninjured.

Anopterus glandulosus, from Tasmania, was much cut at Hythe, but recovered.

Araucaria Bidwillii and young plants of *A. Cunninghamii* both died at Abbotsbury, though a large plant of the latter is safe.

Banksia quercifolia was killed on a south wall at Nuneham Park, but at St. Keverne a plant in the open, seven years old, survived with but slight injury.

Callistemon ericifolius, five years old, and young plants of *C. linearis* and *C. salignus* died at Abbotsbury, but older plants of the last-named are safe, while at St. Keverne *C. lanceolatus* was only slightly injured in the open.

Casuarina torulosa and *C. glauca* died at Abbotsbury, where they had been planted three years.

Correa alba, trained on a west wall, was quite uninjured at Killerton, but *C. cardinalis* (=*C. speciosa*) was badly damaged in the open at St. Keverne.

Drimys aromatica from Tasmania was uninjured at Killerton, where it has stood for over fifteen years.

Eucalyptus amygdalina, in Colonel Sandeman's garden at Hayling Is., suffered slightly with a west exposure, but rather severely with a southerly exposure, though not killed to the ground; *E. cordata* from Tasmania and the species sold at *E. Beauchampiana* were killed in the Society's garden at Wisley and in Mr. Bowles' garden at Enfield, where the former species had been planted twelve years; it shot from the base in the spring, but subsequently died; *E. ficifolia* was killed on a south-east wall at Monreith; *E. globulus* was killed at Foots Cray and Studland, but at E. Sutherland it suffered very slight damage and rather more at Balmae; *E. pulverulenta*, six years old, is reported uninjured at Harrow Weald, and *E. Whittinghamia* at Monreith; at Abbotsbury young plants of all species, except the Tasmanian *E. urnigera*,* were killed, but older plants survived, and eight species were unharmed at Killerton and seven or eight at Poolewe.

Grevillea alpina proved perfectly hardy in Mr. Chambers' garden at Haslemere and on a wall at Horsham; *G. pendula* was slightly

* See p. 370.

damaged on a wall at St. Keverne; *G. juniperina* var. *sulphurea* was quite uninjured at Killerton, but at Camberley a bush twelve years old had some large branches killed.

Kennedya monophylla was slightly injured on a wall at St. Keverne.

Leptospermum bullatum (=*L. scoparium*) was uninjured at Clapham and at Monreith, but a plant over twelve years old died outright at Belvoir Castle; plants of the same genus at Poolewe passed through the winter without injury.

Melaleuca thymifolia, seven years old, died at Abbotsbury.

Muehlenbeckia adpressa was but slightly damaged at Chelmsford, but an old plant in the Royal Gardens, Kew, with a less severe frost, was cut to the ground.

Myoporum acuminatum was killed at Abbotsbury, where it had been growing three years.

Myrtus australis (=*Eugenia myrtifolia*) came through the winter with little damage at Clapham, Yorks.

Olearia paniculata suffered little damage at Haslemere, but *O. argophylla*, three years old, died at Abbotsbury, and *O. myrsinoides* at Hythe, while *O. dentata* was either killed or badly injured at North Mymms.

Pittosporum flavum (=*Hymenosporum flavum*) died at Abbotsbury, and *P. undulatum* at Haslemere; both were newly planted.

Plagianthus pulchellus, trained on a wall, was killed outright in the Royal Gardens, Kew.

Podocarpus alpina, a native of Tasmania, suffered very little damage at Kew.

Pomaderris apetala was killed at Nuneham Park.

Solanum aviculare was killed on a south-west wall at Nuneham Park, and a protected plant suffered greatly in Mr. Fitzherbert's much warmer garden at Dartmouth.

Sollya heterophylla died outright on a west wall at Killerton, was cut to the ground at Hythe, but subsequently grew away strongly; at St. Keverne it survived, with but little damage, on a wall, and seedlings passed through the winter at Mr. Farrer's garden, Clapham, Yorks, unhurt.

Tecoma jasminoides was killed to the ground at Hythe, and subsequently died.

New Zealand.

Arthropodium cirrhatum was killed at Abbotsbury.

Arundo conspicua, which had passed twelve winters without hurt, was seriously damaged at Camberley.

Brachyglottis repanda was only slightly damaged in the open at St. Keverne.

Carmichaelia australis, three years old, was badly damaged at Abbotsbury, but survived.

Cassinia leptophylla was killed outright at Hythe, but *C. Vauvilliersii* survived the winter uninjured on a border at Aldersey.

Celmisia spectabilis was unhurt at Camberley.

Clematis indivisa, clambering over trees in various situations, suffered slightly at St. Keverne, where it had been growing for eight years.

Clianthus puniceus was killed outright under a west wall at Osmington and on a south wall at Nuneham Park, but plants three years old survived, though severely injured, at Abbotsbury.

Corokia buddleioides was severely damaged at Hythe and has since died.

Dicksonia antarctica was slightly cut at St. Keverne.

Fuchsia procumbens was killed on the rockery by water at Elstree, but survived with but slight injury on the rockery at Wisley.

Griselinia lucida died at Abbotsbury, but species of this genus were but little injured on Hayling Is.

Hymenanthera crassifolia was uninjured at Camberley and at Wisley, but at Chelsea Physic Garden received slight damage.

Metrosideros robusta survived almost unhurt on a wall at St. Keverne, but a very young plant succumbed on an open border at Monreith.

Myrtus bullata was severely damaged in the open at St. Keverne.

Notospartium Carmicheliae, fifteen years old, came through the winter uninjured at Camberley, and a young plant with but slight damage at Aldenham.

Olearia Forsteri was badly cut at Crawley, but *O. ilicifolia* was uninjured at Belvoir Castle, where it has stood for over twenty years, and injured but slightly at Mowbray Park, Sunderland; *O. nummularifolia* survived altogether uninjured at Enfield, where it has been planted three years, and at Monreith; while at Monreith a young plant, slightly protected, of *O. Traversii*, and, at Enfield, *O. virgata* were also injured.

Pittosporum Buchanani, planted four years, and young plants of *P. crassifolium* and *P. eugenioides* suffered no damage at Haslemere (though the last was killed to the ground at Chelsea after standing six years), nor did *P. Ralphii* at Harrow Weald; but *P. tenuifolium* was killed outright at Haslemere and Aldersey, and a plant which had stood fourteen years was greatly damaged at Aldenham, though partially covered with matting; *P. Mayi*, uninjured at Haslemere, died at Camberley and was killed to the ground at Hayling Is. and S. Ayrshire.

Plagianthus betulinus was quite uninjured in the open at Haslemere and at Killerton.

Rubus australis was killed to the ground at Enfield, at Camberley the top parts were killed, and it was badly damaged at Thetford.

Senecio compactus died at Enfield, where it had stood exposed to the south for twelve years, and a younger plant exposed to the east was badly damaged; *S. elaeagnifolius* died at Nuneham Park; the latter, however, passed the winter uninjured at Hythe, as did *S. rotundifolius* in the open at St. Keverne; *S. Greyi* was unhurt at St. Keverne, Harrow Weald (where it has grown for nineteen years), and Monreith, but killed to the ground at Enfield and Nuneham Park.

Sophora microphylla was killed to the ground at Enfield.

Stipa arundinacea died at Thetford and was considerably damaged at Camberley, though it began to grow again in the summer.

Veronica Bidwillii, four years old, was killed at Thetford and seriously injured, though not killed to the ground, on the rockery at Aldersey and Monreith; *V. buxifolia* seems to have been but slightly injured in most places; *V. cupressoides* was uninjured in a very exposed position at Hythe, but an old plant was seriously damaged in the open at Chelsea; *V. Dieffenbachii* had its upper parts killed at Camberley; *V. diosmifolia* was killed to the ground at Haslemere; at Wisley *V. elliptica*, *V. ligustrifolia*, and *V. rakiensis* were all killed, and *V. parviflora* var. *angustifolia* was very seriously damaged; *V. epacridea* escaped almost unhurt at Thetford, and *V. Haastii*, which was rather badly injured there, was little hurt in a well-sheltered situation at Hinton Admiral and elsewhere; *V. Hectori*, in an exposed position, was not damaged at Hythe, but was severely cut at Thetford; while the beautiful *V. Hulkeana*, which was uninjured at Killerton on a south wall, was killed to the ground at Enfield and Aldersey and seriously damaged, though not killed, at Corstorphine and Camberley; *V. Lyalli* was not injured at Hythe, nor was *V. lycopodioides* on the rockery at Wisley, and only slightly damaged at Chelsea; *V. macroura* died outright at Camberley; *V. parviflora* died at Enfield, where it had stood fourteen years, and was severely damaged at Thetford; *V. pimeleoides*, uninjured at Hythe and only slightly damaged at Thetford, was more seriously cut, though it recovered at Osmington, and old plants were killed at Enfield; the closely allied *V. glaucocaerulea* was killed to the ground at Thetford; *V.* × *Lindsayi*, which was uninjured at Monreith, died at Enfield, as did *V. speciosa* at Brympton and *V. vernicosa* at Thetford; *V. chathamica* escaped without injury on the cliff in Mr. Farrer's garden at Clapham, though on more open ledges it was somewhat cut and brown; it was unharmed at Hythe. Generally speaking, all the shrubby species were more or less severely injured, and many were killed outright, while the many hybrid forms were greatly damaged or killed.

North America (excluding Texas, Mexico, and California).

Amorpha canescens was slightly damaged at Aldersey, but escaped entirely at Camberley and Clapham, Yorks; *A. fruticosa* was unhurt at Camberley, but severely damaged at Aldersey.

Arbutus Menziesii was unhurt at Belsay Castle * and at Wisley.

Asclepias tuberosa was either severely damaged or killed at Sutton Place, though sheltered, but *A. Cornutii* was unhurt at Belvoir Castle.

Asimina triloba was unhurt in the open at Hythe.

* The tree referred to at Belsay Castle had been growing in a quarry there for over sixty years and had attained a height of 23 feet 9 inches and a circumference at 4 feet from the ground of 1 foot 4 inches. It is with great regret we have to record that this fine specimen was utterly destroyed by a snowfall in the winter of 1909-10.

Atriplex canescens (newly planted) was unhurt at Aldenham.

Baccharis halimifolia was slightly damaged at Wisley, but unhurt in the open at Chelsea.

Baptisia australis was unhurt at Belvoir Castle and Wisley.

Berberis Fremontii was unhurt at Enfield.

Bignonia capreolata was severely damaged at Slough, and killed to the ground at Hever Castle.

Calycanthus floridus was unharmed in the open at Wisley and Clapham, Yorks; and on a south wall at Aldersey, as were *C. occidentalis* and *C. laevigatus* in the open at Wisley.

Cassia marylandica and other species died on a south wall at Abbotsbury.

Castanopsis chrysophylla was severely damaged at Abbotsbury, but was unhurt at Wisley.

Ceanothus Fendleri was unhurt at Sutton Place.

Celtis occidentalis was unhurt at Chelsea, where it has grown for nine years.

Cestrum Newellii was killed outright on a south wall at Nuneham Park, and slightly damaged on a wall at St. Keverne, and *C. Smithii* was killed to the ground at Hythe.

Chionanthus virginica was unhurt at Belvoir Castle and Wisley.

Clethra alnifolia was killed at Abbotsbury, but unhurt at Harrow Weald, where it has stood for twenty-one years, and at Wisley.

Cornus Nuttallii was unhurt at Aldenham; *C. oblongifolia* was slightly damaged at Haslemere.

Crataegus angustifolius was slightly cut both on walls and in the open, but completely recovered at Horsham.

Cupressus Lawsoniana was severely injured at Isleworth and at Aston Rowant.

Cyrilla racemiflora was slightly damaged at North Mymms.

Decumaria barbara was quite unhurt on a cliff at Clapham, Yorks.

Elliottia racemosa was uninjured at Kew.

Eriogonum umbellatum was damaged at Wimbledon, but unhurt at Belvoir Castle.

Eryngium Lassauxii was killed to the ground at Enfield.

Fothergilla alnifolia and *F. major* were unhurt at Aldenham.

Gordonia Lasianthus was seriously damaged at Hythe, but started into growth again in May.

Gymnocladus canadensis was unhurt at Tortworth, where it has grown for six years.

Halesia tetraptera suffered no hurt at Wisley, Belvoir Castle, Aldersey, Horsham, and Clapham, Yorks.

Houttuynia californica was killed at Camberley after growing for six years.

Hydrangea arborescens grandiflora was unhurt at Burford and Wisley.

Hypericum aureum was killed to the ground at Thetford, as was *H. elatum*, which was killed outright at Wisley and at Mowbray Park; *H. Kalmianum* was unhurt at Hornby Castle.

Illicium floridanum was severely cut at Hythe, where it was newly planted.

Itea virginica was badly damaged at Aldenham and North Mymms.

Kalmia angustifolia, *K. latifolia*, *K. rubra*, and *K. glauca* were badly injured near a stream at Colwyn Bay, but the last was unhurt at South Ayrshire and the second at Alloa; no species was hurt at Wisley.

Larix occidentalis seedlings, two years old, were unhurt at Tortworth.

Leucothoe racemosa was unhurt at Harrow Weald, as were both that and *L. Catesbaei* at Wisley.

Lewisia Tweedyi was uninjured at Enfield with a glass light, open at the side, over the bed.

Lonicera involucrata had the tips of its branches cut at Wisley.

Magnolia rustica was unhurt at Clapham, Yorks; *M. acuminata** was unhurt at Belsay Castle, where it has stood for forty-three years; *M. grandiflora* was unhurt at Belvoir Castle, Clapham, Yorks, and Mulgrave Castle, Whitby, on a wall, and slightly damaged at North Mymms in the open, but trees on walls there were unhurt; *M. macrophylla* was killed to the ground at Burford.

Negundo aceroides was severely damaged at Studland.

Neillia opulifolia was unhurt at Chelsea and Wisley; *N. Torreyi* was not damaged at Aldersey.

Nuttalia cerasiformis was unhurt at Clapham, Yorks, and at Wisley.

Oenothera pumila was killed on a south wall at Sutton Place, but *O. speciosa* escaped injury at Hornby Castle.

Opuntia Rafinesquii was unhurt at Corstorphine.

Oxydendron arboreum, unhurt at Wisley, was slightly injured at North Mymms.

Pentstemon Cobaea, *P. laevigatus*, *P. Menziesii*, and *P. tubiflorus* were all more or less damaged at Thetford, but not killed.

Polemonium confertum was severely damaged on the rockery at Monreith.

Polygonum cilinode was unhurt at Enfield.

Prunus Besseyi was unhurt in the open at North Mymms, and *P. ilicifolia* escaped with slight damage on a south wall at Horsham.

Rhus glabra laciniata was killed outright at Burford, but was unhurt at Aldersey, as was *R. Toxicodendron* at Belvoir Castle.

Ribes speciosum was killed to the ground at Wisley and Braintree, and severely injured at Camberley, Corstorphine, and Aldenham, though unhurt at Clapham, Yorks; *R. Spaethianum* (*R. inebrians*) was unhurt at Clapham, Yorks.

Rubus deliciosus was unhurt at Enfield and Wisley.

Sassafras officinale was unhurt at Camberley (where it has stood for eight years), Tortworth, and Aldenham.

Sedum pulchellum was unhurt at Belvoir Castle.

* A very fine tree, 39 feet tall, with a circumference of 2 feet 7 inches at 4 feet from the ground.

Shortia galacifolia was unhurt at Camberley, Hornby Castle, and Wisley.

Sisyrinchium angustifolium was unhurt at Chelsea, but severely damaged at Thetford, as was *S. grandiflorum* at Chelmsford.

Spiraea discolor ariaefolia was killed at Whitby after growing for seven years, but was quite unhurt at Wisley; *S. tomentosa*, newly planted, was injured at Stisted.

Stenanthium robustum was unhurt at Hinton Admiral in a sheltered place.

Tecoma radicans was unhurt at Chelsea on a south-west wall.

Triosteum perfoliatum was unhurt at Aldenham, where it has grown for three years.

Vaccinium ovatum was unhurt at North Mymms.

Yucca filamentosa was damaged at Isleworth; *Y. gloriosa* at Burford and Thetford.

Zenobia speciosa was killed on the rockery at Foots Cray, but unhurt at Wisley and Harrow Weald.

California.

Aesculus californica was uninjured at Belvoir Castle.

Aplopappus ericoides suffered slightly, but recovered at Cambridge, and had its tips injured on a south-east wall at Haslemere.

Calycanthus occidentalis was killed back to its main branches at North Mymms, but was uninjured at Wisley.

Ceanothus dentatus was killed in the open at Cobham (and badly cut on a west wall), and at Nuneham Park on an east wall, as was *C. papillosus* at Haslemere; *C. rigidus* was slightly injured at Kew on a wall, and *C. divaricatus* and *C. floribundus* were quite uninjured in the milder winter of Whitby and Colwyn Bay on walls. *C. thyrsiflorus* was badly hit in the open, but proved the hardiest at Kew; *C. integerrimus* was slightly damaged at Kew on a wall, and at Chelsea.

Crossosoma californicum died outright at Hythe.

Cupressus macrocarpa was slightly injured at Aldenham and Slough; its variety *sulphurea* was killed to the ground at Aldenham, and the variety *lutea* had its lower branches severely damaged at Aston Rowant, and was slightly cut at Osterley Park and Hinton Admiral, where the tips of the young growths were killed.

Dendromecon rigidum was killed on a south wall at Kew, and at Abbotsbury.

Fremontia californica was killed to the ground on a wall at Clapham, Yorks, and, though protected, was damaged so as to prevent its flowering at Cambridge, slightly injured at Horsham, but uninjured at Hythe, Crawley, at Powis Castle on a wall, and on a wall at Kew.

Lathyrus splendens was slightly damaged on a west wall at St. Keverne.

Lavatera assurgentiflora was killed at Abbotsbury.

Mimulus glutinosus, newly planted, was killed at Abbotsbury.

Myrica californica had all its leaves browned and appeared quite dead at Camberley, but buds afterwards developed.

Ribes viburnifolium was killed outright in the open at Cambridge.

Sequoia gigantea was severely damaged at Isleworth.

Umbellularia californica was quite unharmed in the open at Kew and at Camberley, where it has stood six years.

Yucca Whipplei was unhurt on the rockery at Hinton Admiral.

Zauschneria californica was unharmed at Belvoir Castle, but some plants were killed and others badly damaged at Sutton Place.

Mexico and Texas.

Abutilon acerifolium was killed at Abbotsbury after standing three years.

Abelia floribunda was uninjured at Harrow Weald, where it was protected by having glass over the roots; but on a south wall at Nuneham Park it was killed.

Agave ferox was killed at Abbotsbury, but several other species, though somewhat injured, survived.

Beschorneria yuccoides was badly cut at Abbotsbury.

Cedronella cana died at Camberley.

Cereus paucispinus and *C. viridiflorus*, protected by a glass light over the bed, were uninjured at Enfield.

Cestrum elegans, several years old, died at Abbotsbury.

Cowania mexicana was severely damaged at Haslemere, though not cut to the ground.

Desmodium cinerascens passed the winter uninjured in the open at Hythe.

Fendlera rupicola was unharmed at Enfield, North Mymms, and Killerton.

Fuchsia microphylla, with a north exposure, was killed outright at Hever Castle.

Gaura Lindheimeri was not hurt at Monreith.

Jamesia americana, in a fully exposed position, was uninjured at Harrow Weald, where it had stood for twenty-one years, and was slightly damaged at Aldersey.

Juniperus pachyphloea was uninjured on the rockery at Hinton Admiral.

Lobelia Cavanillesii was unhurt at Camberley, and *L. fulgens* at Newbury.

Oxalis lasiandra suffered no hurt at Enfield.

Pinus Ayacahuite was not injured at Cambridge.

Prunus orthosepala was uninjured at Tortworth.

Salvia chamaedryoides was uninjured at Camberley, where it has grown for six years.

Tropical America and West Indies.

Abutilon megapotamicum was killed to the ground on a south wall at Horsham, but recovered; it lost its leaves on a south-east wall at Haslemere.

Cassia bicapsularis, *C. floribunda*, and *C. tomentosa* died at Abbotsbury, where *C. laevigata* was severely damaged.

Cestrum aurantiacum was killed on a south wall at Nuneham Park.

Escallonia floribunda was unhurt at Harrow Weald and slightly damaged at Killerton.

Garrya Fadyena, from Jamaica, was seriously injured on a wall at Cambridge, and killed at Abbotsbury; *G. Thurettii* was slightly damaged at Sutton Place.

Griselinia macrophylla (=*Lonchocarpus sericeus*) was killed in the open at St. Keverne; *G.* (*L.*) *latifolia* was killed to the ground at Hayling Island.

Nesaea salicifolia (=*Heimia grandiflora*) had all the younger growths killed at Crawley, but was killed outright at Aldenham, and to the ground at Enfield.

Solanum Wendlandii was killed on a south wall at Killerton.

Yucca aloifolia was killed at Isleworth.

Argentine Region.

Buddleia thrysoidea was killed at Abbotsbury.

Caesalpinia Gilliesii was killed outright at Abbotsbury (young plants) and on the west wall of the Cactus House at Cambridge, but on a high south wall at Belvoir Castle was only slightly injured.

Cassia corymbosa: young plants on an east wall died at Monreith, and older ones were severely injured on a wall at St. Keverne and at Abbotsbury.

Escallonia montevidensis on a west wall suffered slight damage at St. Keverne, but was cut to the ground in the open at Nuneham Park.

Heliotropium anchusaefolium suffered no damage at Belvoir Castle, where it had been growing for six years.

Tropaeolum pentaphyllum was not hurt at Isleworth.

Verbena venosa suffered varying amounts of damage at Monreith, some plants being killed completely, while others were but little harmed.

Brazil.

Abutilon striatum was killed to the ground on a west wall at Camberley, where it had grown for eight years.

Bougainvillaea glabra died at Abbotsbury, where it had been growing for several years in a sheltered position.

Calliandra Tweedii died at Abbotsbury.

Cocos leiospatha, reputed the hardiest of its genus, had its centre killed at Cambridge, although protected.

Eryngium pandanifolium, seven years old, was killed to the ground in a dry situation at Enfield.

Escallonia organensis was badly damaged on a wall facing south-east at Haslemere.

Gynerium argenteum was badly injured by the lake side at Osterley Park, and in exposed places in Mr. Shea's garden at Foots Cray, but was comparatively little hurt in most places, as at Belvoir Castle.

Lasiandra macrantha was badly damaged at Hythe, and has since died.

Oxalis brasiliensis came through the winter at Enfield without injury.

Schinus dependens was slightly damaged in the open, where it has stood for nineteen years, at Haslemere, and at Kew was cut to the ground-level.

Schubertia (=*Arauja*) *grandiflora* was killed to the ground at Hythe, and never recovered.

Tacsonia mollissima was slightly damaged on a south wall at St. Keverne.

Chile, Peru, and the Adjacent Islands.

Alstroemeria aurantiaca and *A. chiloensis* were unhurt at Belvoir Castle.

Araucaria imbricata was slightly damaged in the nursery at Slough, but seems to have suffered but little in most places.

Aristotelia Macqui lost its leaves at Haslemere, and was seriously damaged at Aldenham, where the variegated form was killed to the ground.

Azara dentata was unhurt at Belvoir Castle, but *A. Gilliesii* was killed to the ground at Nuneham Park, but shot up from the base again; and *A. integrifolia* was killed to the ground at Tetbury.

Berberidopsis corallina was killed at Wisley and on a south wall at Aston Rowant, slightly cut only at Monreith on a south wall and on a wall at North Mymms, and unhurt at Killerton on a west wall and at Belvoir Castle.

Berberis congestiflora died at North Mymms, where it had grown for four years; *B. Darwinii* was severely damaged at Cobham and Sutton Place, and slightly at Hever Castle, Lamberhurst, and Wisley, but killed to the ground at Wye and Slough (young plants). The beautiful hybrid *B. stenophylla*, of which *B. Darwinii* is one of the parents, is not reported injured in any part of the country.

Calceolaria integrifolia was unhurt at Killerton, but *C. violacea* died on a west wall there, and was killed to the ground at Hinton Admiral and Harrow Weald, though only slightly damaged in the open at St. Keverne; *C. amplexicaulis* was killed at Abbotsbury, where other species stood safely; *C.* × *Burbidgei* was killed at St. Keverne.

Cantua buxifolia died at Abbotsbury, and was killed to the ground at Hythe.

Cassia coquimbensis was killed at Abbotsbury.

Colletia cruciata was killed to the ground at Thetford and North Mymms, and seriously damaged at Elstree and Nuneham Park; *C. spinosa*, uninjured at Chelsea and North Mymms, was killed to the ground at Wisley and Thetford.

Datura sanguinea was killed to the ground in the open at St. Keverne.

Diostea juncea escaped unhurt at Aldenham.

Eccremocarpus scaber was unhurt at Belvoir Castle and against a wall at Newbury, where in the open it was killed outright.

Ercilla spicata was slightly damaged on a south-west wall at Chelsea; *E. volubilis*, which had been exposed for five years to the east on a wall at Aldenham, had its branches badly cut.

Escallonia rubra, killed to the ground at Camberley and Chelmsford was unhurt at Belvoir Castle; *E. exoniensis* was unhurt at Camberley, and only slightly damaged at Chelsea; *E. Ingramii* was unhurt at Belvoir Castle, but badly damaged at Colwyn Bay; the hybrid *E. langleyensis* was unhurt at Enfield, North Mymms, Aldersey, and on south walls at Clapham and at Dumfries, but some plants were killed to the ground at North Mymms, and others had their tips cut, those exposed to the south perhaps suffering worst there; *E. Phillipeana* was unhurt at Camberley, where it has grown for twelve years, Wisley, North Mymms, and Belvoir Castle, and was not reported from any garden as damaged.

Eucryphia cordifolia was killed at Hythe and North Mymms, but escaped altogether at Killerton, St. Keverne, and Monreith.

Eugenia apiculata was unhurt at Monreith, where it was slightly protected, and only slightly damaged at Hythe.

Fagus obliqua was unhurt at Tortworth, Kew, and Monreith.

Fuchsia gracilis died at Hever Castle, as did *F. Riccartoni*; the latter was unhurt at Whitby and East Sutherland, and only slightly damaged at Belvoir Castle, but killed to the ground at Camberley, Hinton Admiral, and Alloa; *F. serratifolia* was cut to the ground, where it had been standing for several years at Abbotsbury; *F. pumila* was killed to the ground at Harrow Weald and much damaged at Thetford; several species were killed to the ground at Abbotsbury.

Lapageria rosea was unhurt on a west wall at Killerton, but killed outright on a north wall at Nuneham Park, and to the ground on a wall at North Mymms, but grew away again strongly.

Lathyrus pubescens escaped with but slight damage on a west wall at St. Keverne.

Libertia caerulescens was seriously damaged at Abbotsbury, and *L. formosa* at Chelmsford.

Libocedrus chilensis was unhurt at Kew; *L. leptolepis* was slightly damaged at Haslemere.

Lippia citriodora (=*Aloysia citriodora*) was killed to the ground at Camberley, Abbotsbury Castle, and Brympton, where it had grown for thirty years, but was uninjured at Belvoir Castle and Balmae, Kirkcudbright.

Lomatia obliqua was unhurt in a sheltered position against a wall at Kew.

Margyricarpus setosus was unhurt on the rockery at Aldersey, but killed at Thetford.

Mitraria coccinea died at Enfield, and was left "just alive" at Hythe and Clapham, Yorks, but was unhurt on a south wall at Killerton

and at the foot of the rockery at Monreith; it was slightly damaged on a west wall at Horsham.

Modiola geranioides was unhurt at Enfield, where it has grown for twelve years, but died at Thetford.

Mutisia decurrens was severely cut at Monreith on a south wall and protected with bracken, but escaped unhurt at Hythe, on a west wall at Killerton, and on a south wall at Burford; *M. Clematis*, from New Grenada, was killed outright on a west wall at Burford and to the ground at Hythe, but was only slightly damaged on a wall at St. Keverne.

Myrtus Ugni was killed after growing for nine years on a south wall at North Mymms.

Nierembergia frutescens was unhurt at Hythe.

Ourisia coccinea (wet at the roots) was not damaged at Harrow Weald

Oxalis lobata escaped damage at Enfield.

Podocarpus andina was severely cut at Aldenham, and *P. chilina* but slightly at Kew.

Rhaphitamnus cyanocarpus was killed on a south wall at Kew, at Hinton Admiral, and on a south wall at Nuneham Park, and was severely cut on a west wall at Horsham, and slightly at Killerton.

Tricuspidaria lanceolata was unhurt both on walls and in the open at Monreith, Killerton, and Harrow Weald, but was killed at Aldenham and severely cut at Hythe; *T. dependens* (=*T. Hookeriana*) was uninjured in the open at Killerton, slightly injured at St. Keverne, Hythe, in protected places at Crawley and on a west wall at Horsham, killed to the ground at Burford, and killed on walls at Cambridge and Nuneham Park.

Tropaeolum tuberosum was uninjured at Isleworth.

Vitis striata was slightly damaged, though protected, at Aldenham.

Patagonia and the Straits of Magellan.

Baccharis patagonica was killed to the ground at Aldenham, where it has grown for sixteen years, and severely damaged at Wisley, North Mymms, and Tetbury.

Berberis buxifolia was severely cut at Wisley.

Calceolaria plantaginea was unhurt against a south wall at Clapham, as was *C. polyrrhiza* in all situations.

Drimys Winteri was unhurt at Killerton and on a south-west wall at Monreith, but, newly planted, was killed to the ground at Aldenham.

Embothrium coccineum was unhurt at Hythe, Killerton, Poolewe, Monreith, Belvoir Castle, and Clapham, Yorks, and slightly cut on a wall at Horsham.

Escallonia pterocladon was killed at Wisley and on a north wall at Nuneham Park, but on a west wall at Horsham it was unhurt.

Fagus antarctica, from the Magellan region, was unhurt at Kew and but slightly damaged at Hayling Island; the evergreen *F. betuloides* from the same region was severely damaged at Kew.

Fitzroya patagonica was unhurt at Kew, and the fine tree, sixty years of age and over thirty feet tall, in the quarry at Belsay Castle was uninjured.

Pernettya mucronata was killed to the ground at Wisley and severely injured at Sutton Place and at North Mymms, but was unharmed at Whitby and Alloa.

Philesia buxifolia was unhurt at Hythe.

Schinus patagonica was very slightly damaged at Hythe and unhurt at Haslemere.

Africa.

Adenocarpus anagyrus, from the Canary Is., died on a south wall at Nuneham Park.

Agapanthus umbellatus passed the winter uninjured, with the crowns covered with ashes, at Enfield, no difference being noticed in the behaviour of the varieties *caulescens*, *intermedius*, *Leichtlini*, *Moorei*, *St. Paulii*, *umbellatus*, and *Wellinghii*, which are growing there and at Camberley.

Albizzia Julibrissin was unhurt at Harrow Weald, where it has stood for twenty-one years.

Arbutus canariensis, from the Canary Islands, was slightly damaged at Abbotsbury, but unharmed at Killerton and Poolewe.

Buddleia auriculata suffered little damage at Hythe, but a young plant of *B. madagascariensis* was killed outright at Abbotsbury.

Cassia capensis died at Abbotsbury.

Chlorophytum Bowkeri was unhurt at Enfield.

Crinum Moorei survived at Enfield with its crown covered with ashes, and at Monreith, where, however, it was slightly damaged; *C.* × *Powelli* was unhurt in most gardens, especially when protected with ashes, but at Aston Rowant and Monreith it suffered slightly.

Dracaena Parryi was slightly damaged at Abbotsbury, but recovered.

Dierama ensifolium and *D. pulcherrimum* was unhurt at Monreith, and the latter also at Camberley, where it has stood six years, and the former at Wisley.

Diospyros senensis was unhurt at Haslemere.

Echium callithyrsum, from the Canary Islands, was killed at Abbotsbury.

Eriocephalus africanus died at Abbotsbury, where plants have been killed three years in succession.

Felicia abyssinica, newly planted, died at Abbotsbury.

Genista virgata, from Madeira, suffered no damage at Harrow Weald, where it had stood for thirteen years, nor at Kew, where it is naturalizing itself.

Gerbera Jamesonii was killed at Newbury, and had all its foliage killed at St. Keverne, but, protected by covering with a foot of ashes at Burford, it was quite uninjured.

Haplocarpha scaposa was uninjured in a bed covered with a light at Enfield.

Kniphofias were usually not much hurt, but *K. Tysonii* was killed at Monreith, while *K. caulescens* suffered nothing, and at Chelmsford *K. Uvaria* was badly damaged.

Leonotis Leonurus, on a wall exposed to the west and south at St. Keverne, was killed.

Mesembryanthemums were usually destroyed or very badly damaged, but *M. uncinatum* was uninjured at Corstorphine.

Pelargonium saniculaefolium was killed at Chelsea, but seedlings have come up from the plants.

Phygelius capensis survived uninjured at Belvoir Castle, where it has stood for six years, and at Chelmsford.

Plumbago capensis was killed at Abbotsbury.

Psoralea pinnata suffered more or less damage at St. Keverne on walls, plants facing south suffering more than those facing west.

Pteronia incana was killed at Abbotsbury.

Sutherlandia frutescens was killed on a south wall at Burford.

Thunbergia natalensis was uninjured on a wall at Killerton, where it has grown for six years.

Micromeria varia (=*Thymus ericifolius*), from the Canary Islands, was unhurt at Thetford.

Vallota purpurea was unhurt at Enfield.

Vaccinium padifolium, from Madeira, was unhurt at Kew, where it has grown for over sixty years.

South Europe, North Africa, Levant, and Persia.

Abies pectinata lost many of its needles at Aston Rowant.

Adenocarpus decorticans was slightly damaged in the open at North Mymms.

Althaea cannabina was killed outright at Abbotsbury.

Arbutus × *hybrida*, unhurt at Horsham, was slightly damaged at Tetbury; at Waltham, Essex, and at Tamworth the injury to members of this genus was severe.

Arundo Donax was killed to the ground at Camberley, and *A. mauritanica* was killed outright at Abbotsbury.

Asparagus acutifolius was killed to the ground at Enfield, and some were killed at Camberley, but others escaped altogether.

Astragalus Tragacantha was unhurt at Aldenham.

Astraphaxis Billardieri was unhurt at Camberley, where it has grown for five years.

Atriplex Halimus was severely cut in the open at Aldenham, and killed to the ground at Sutton Place.

Caltha polypetala was uninjured at Burford, Wisley, and St. Keverne.

Calycotome spinosa was slightly injured at Abbotsbury.

Cedrus atlantica, in an open situation, was killed at Cobham, Surrey, and its variety *glauca* suffered severely in many places; it was, however, uninjured at Isleworth, as was *C. Libani*.

Ceratonia Siliqua was badly damaged at Abbotsbury, but recovered.

Cercis Siliquastrum was unhurt at Chelsea, but had the last season's growths killed at Hinton Admiral, and was seriously damaged at Aldersey.

Cistus villosus (=*corsicus*) was killed at Thetford, and either killed to the ground or killed completely at Wisley, but was unhurt at Belvoir Castle; *C. corbariensis* was killed near the water at Aldenham, but survived with more or less injury at Kew and Chelsea; *C. creticus* was unhurt at Belvoir Castle; *C. formosus* died at Aldenham, where it had grown two years, but was unhurt in the open at Monreith; *C. longifolius* and *C. cyprius* were badly cut at Thetford, where *C. crispus* was killed; the upper shoots of *C. cyprius* were killed at Camberley on a south wall, and it was killed to the ground at Kew, but broke from the base; it was killed outright at Hever Castle; *C. laurifolius* was killed at Chelsea, and severely injured at Thetford, but only slightly at North Mymms, Kew, and Wisley, and escaped unhurt at Belvoir Castle and Clapham; *C. parviflorus cymosus* died at Thetford, as did *C. populifolius* at Hever Castle, and *C. heterophyllus* at Chelsea; *C. lusitanicus* was severely damaged at Epping (where some plants died) and North Mymms, but survived at Kew, and was unhurt at Camberley; *C. recognitus* survived at Kew; *C. salvifolius* was more or less injured, but not killed, at Thetford, Wisley, and Kew, and some plants of that species were killed at North Mymms, while others escaped with some injury; several species were killed outright at Chelmsford and Horsham; all species grown were unhurt at Haslemere, except *C. purpureus*, which was killed, and none, though badly damaged, were killed at Cambridge or Wimbledon.

Convolvulus Cneorum died at Cambridge, though protected, and was slightly damaged (with some protection) at Chelsea.

Coronilla valentina and *C. viminalis* were killed at Abbotsbury.

Coriaria myrtifolia had the points of the shoots killed at Chelsea.

Cytisus leucanthus (=*C. austriacus*) was badly damaged at Aldenham, as were well-established plants of *C. candicans* at Abbotsbury, where it had stood several years, and *C. praecox* at Chelmsford; *C. elongatus* was more or less injured at North Mymms, where some plants were killed; *C. proliferus*, from Teneriffe, was slightly damaged in the open at St. Keverne; *C. Ardoinii* was damaged at Wimbledon.

Daboecia polifolia was unhurt at Wisley and Clackmannan, but at North Mymms and Thetford it was badly damaged.

Danae Laurus was badly damaged at Aldenham in the open, and at Aston Rowant, but unhurt at Camberley and in the wood at Wisley.

Daphne Cneorum was unharmed at Aldersey and on the rock garden at Wisley, but *D. Mezereum* was killed at Langley Park (var. *alba*) and in S. Ayrshire, where it had grown for sixteen years, though unhurt at Alloa and Whitby; *D. Fisiana* was killed at Hinton Admiral.

Digitalis lanata was killed at Camberley.

Dorycnium suffruticosum had the greater part of its branches killed at Camberley.

Echinophora spinosa was unhurt at Camberley.

Erica arborea was slightly damaged at Kew (though the variety *alpina* was not hurt there in the least), but was unhurt at Killerton, Belvoir Castle, and Monreith (among shrubs); *E. australis* was killed to the ground at Byfleet and Kew, but unhurt at Killerton and Belsay Castle; *E. stricta* and *E. mediterranea* were unhurt at Belvoir Castle; the last was unhurt at Enfield and at Kew had only the succulent autumn shoots damaged, but was killed to the ground at Byfleet; *E. stricta* suffered no damage whatever at Kew; *E.* × *Veitchii* (= *E. lusitanica* × *E. arborea*) was damaged at Kew more than either of its parents, but it escaped injury at Killerton.

Erinacea pungens was unhurt on the rock garden at Clapham.

Euphorbia Characias was killed at Enfield (but yearling seedlings survived) and Camberley, and *E. amygdaloides* at Thetford; the latter was badly damaged at Enfield, where *E. Wulfenii* was killed to the ground; *E. biglandulosa* died at Enfield; *E. Sibthorpii* was unhurt at Horsham.

Fontanesia Fortunei was slightly damaged at North Mymms.

Genista radiata was unhurt at Chelsea, and *G. aethensis* at Camberley; *G. aristata* (= *G. dalmatica*) was damaged at Wimbledon.

Halimodendron argenteum did not suffer at Hayling Island.

Helianthemums were badly damaged at Thetford, where many rock plants suffered severely, but were not as a rule greatly hurt; *Helianthemum halimifolium* and *H. umbellatum* were, however, killed to the ground at Kew, where *H. alyssoides*, *H. formosum*, *H. ocymoides*, and *H. vineale* survived; *H. variabile* was killed to the ground at Chelmsford and severely damaged at Thetford.

Helichrysum angustifolium was badly damaged at Thetford.

Helxine Soleirolii was slightly damaged at Thetford and at Wisley on the north side of a stone in the rock garden, but was unhurt at Harrow Weald and at Camberley.

Hibiscus syriacus was badly damaged at Slough, and in some cases was killed to the ground at Wisley, but other plants escaped unhurt, as they did at Camberley and Clapham.

Hypericum Androsaemum was killed to the ground at Thetford, Osterley Park, and Wisley; *H. balearicum* and *H. cuneatum* were badly damaged at Thetford; *H. calycinum* was killed to the ground at Slough; *H. Coris* was somewhat damaged at Wimbledon and killed at Thetford; *H. fragile* was unhurt in the open at St. Keverne; *H. polyphyllum* was killed at Thetford, and several shrubby species were killed at Sutton Place.

Kitabelia × *Lindemuthii* proved quite hardy at Corstorphine.

Lavatera maritima was badly damaged at Abbotsbury.

Lavendula Spica was slightly damaged at Wisley, and more severely at Aldenham, Sutton Place, and Hever Castle, while at Waltham some of the common lavender was killed, and it was much injured at North Mymms.

Ligustrum vulgare was rendered leafless in many places, and is reported to have had its branches badly cut back at Chelmsford and Hayling Island.

Linum flavum was killed to the ground at Mowbray Park, and killed at Thetford; the Cretan *L. arboreum* was killed at Aldenham.

Lithospermum prostratum, *L. petraeum*, and *L. rosmarinifolium* were damaged at Wimbledon, where several other rock plants suffered, and the last suffered at Foots Cray and was killed at Thetford; *L. prostratum* on a south wall was badly damaged at Sutton Place

Lonicera Caprifolium was slightly damaged at Hever Castle.

Medicago arborea was killed on a south wall at Nuneham Park.

Myricaria germanica was unhurt at Aldersey and S. Ayrshire.

Olea europaea was slightly damaged at Abbotsbury, and killed to the ground at Cambridge, but escaped with slightly searing of the foliage at Chelsea.

Omphalodes Luciliae was unharmed on the rockwork at Monreith.

Ononis rotundifolia was killed at Sutton Place, while young plants were unharmed there.

Origanum Dictamnus was unhurt at Belvoir Castle.

Ostrowskia magnifica died at Foots Cray.

Othonnopsis cheirifolia, from Algeria, suffered only slight damage at Aldersey in the open.

Paliurus australis was slightly damaged at Wisley.

Parrotia persica sustained no injury at Belvoir Castle.

Periploca graeca was killed to the ground at Wisley, and badly damaged at Abbotsbury.

Phillyrea angustifolia was rendered almost leafless at Kew and at Chelmsford, as were *P. media* and *P. latifolia* at Kew, but at Chelsea it had only its leaves seared; *P. decora* was unhurt at Wisley, and was the only species to retain most of its leaves at Kew; it was slightly damaged at Mowbray Park; *P. Vilmoriniana* was unhurt at Osterley Park, but killed outright at Nuneham Park.

Pinus halepensis had its foliage browned at Cambridge, and seedlings in the open were killed outright.

Polygonum equisetiforme was slightly damaged at Chelsea; *P. Baldschuanicum* was unhurt everywhere, except one weak plant at Aldersey.

Potentilla alchemilloides was severely damaged at Thetford; *P. Friedrichseni* was unhurt at Aldenham.

Prunus lusitanica was slightly damaged at New Galloway; *P. Laurocerasus* was damaged at Wye and New Galloway, and more severely at Chelmsford, and those newly planted at Osterley Park.

Pyrus Niedzwetzkyana was unhurt at Tortworth.

Quercus alnifolia, from Cyprus, escaped hurt at Haslemere; *Q. Ilex* was greatly disfigured in many places, though not seriously damaged.

Rhamnus Alaternus was severely cut at Aldenham.

Rhododendron caucasicum and *R. Smirnowi* were unhurt at Harrow Weald, as was *R. ferrugineum* at Arden, where many alpines were killed.

Rhus Cotinus was severely damaged in South Ayrshire.

Ruscus aculeatus was slightly damaged at Mowbray Park.

Salvia bicolor (=*S. dichroa*) was unhurt at Hythe, but killed at Thetford, as was *S. viscosa*.

Senecio macrophyllus was unhurt at Belvoir Castle.

Spiraea media was severely damaged at Aldenham, and *S. confusa* was reported damaged at Alloa, though usually quite hardy; many shrubby species were slightly cut at Aldersey.

Staphylaea colchica was slightly damaged at North Mymms, but was unhurt at Wisley, Belvoir Castle, and Alloa.

Smilax sagittaefolia was severely cut at Camberley.

Styrax officinale was unhurt on a south-west wall at Chelsea.

Tamarix hispida aestivalis was unhurt at Camberley.

Teucrium fruticans died at Chelmsford, but was only slightly damaged at Hythe.

Ulmus turkestanica was uninjured at Tortworth.

Veronica caespitosa was killed at Hornby Castle.

China and Central Asia.

Aconitum Hemsleyanum was uninjured in Sir Trevor Lawrence's garden at Burford, as was *A. Wilsoni* there and at St. Keverne.

Actinidia chinensis was unhurt at Burford, Crawley, Haslemere (on a wall), Enfield and North Mymms, and *A. Kolomikla* escaped uninjured at North Mymms and at Camberley.

Ailanthus Giraldii was uninjured at Haslemere, as were young trees of *A. Vilmoriniana* at Haslemere, Kew, and Cambridge.

Akebia quinata on a wall at Wisley was rather badly damaged, but escaped uninjured on a wall at Aldersey, and at Belvoir Castle and Clapham, Yorks.

Aralia mandschurica was unhurt at Tetbury.

Artemisia lactiflora is perfectly hardy in the many gardens from which it is reported.

Aspidistra lurida was badly hit at Abbotsbury, where it had stood for four years.

Astilbe Davidii and *A. grandis* were uninjured at Wisley and Stoneyford, and the former was also reported undamaged at Alloa.

Bankinia yunnanensis was killed at Nuneham Park on a south wall.

Belamcanda chinensis (=*punctata*) was killed at Chelsea, where it had been planted four years.

Berberis acuminata was uninjured in the open at Kew, Burford, Cambridge, and Stoneyford; *B. dictyophylla* at Kew and Clapham, Yorks; *B. Wilsonae* at Kew, Burford, St. Keverne, and Stoneyford; *B. Fortunei* was uninjured at Belvoir Castle, but at Aldenham and Slough was severely cut back, and was killed to the ground at North Mymms; *B. sinensis* was slightly damaged at Hever, Kent, but soon quite recovered; *B. sanguinea* was unharmed in the open at Burford.

Buddleia Hemsleyana was not injured at Camberley or Cambridge, but was killed to the ground, though the cold was much less severe, at Harrow Weald, where *B. Lindleyana* was uninjured, as it was at

Aldersey, though it was killed outright at Wisley and at North Mymms.

Camellias were killed at Byfleet, Surrey, but elsewhere they escaped uninjured; *C. Sasanqua* was unhurt on a north wall at North Mymms, and this and *C. japonica* protected by the terrace wall at Clapham, Yorks; *C. Thea* was unhurt at Camberley, where it has grown for five years.

Caragana arborescens proved perfectly hardy on Hayling Island.

Chionanthus retusa was uninjured at Chelsea.

Clematis montana rubens was uninjured at Burford, Crawley, Hinton Admiral, St. Keverne, and Corstorphine.

Clerodendron foetidum was uninjured at Belvoir Castle, where it has stood for twelve years, as was *C. Fargesii* at Haslemere; the former was killed to the ground in the open at Nuncham Park, and suffered slight damage at Warnham Court, Horsham, on a west wall.

Coriaria terminalis is reported as uninjured at North Mymms, Monreith, and Clapham, Yorks.

Cornus macrophylla was unhurt at Tortworth and Wisley.

Corydalis cheilanthifolia was uninjured at Wisley and Monreith, and both that and *C. thalictrifolia* at Killerton.

Cotoneaster adpressa passed the winter uninjured at Kew and at Enfield, *C. applanata* at Kew, Burford, and Alloa, and *C. bullata* at Kew; *C. Franchetti* was not damaged at Aldenham, but at North Mymms the shoots were killed back to the main branches; *C. horizontalis* suffered no damage at North Mymms or at Wisley, nor did *C. moupinensis* at Kew or Bettws-y-Coed; *C. humifusa* is reported unharmed from Kew, Burford, Enfield, Bettws-y-Coed, and Alloa, though seedlings were injured at Kew; *C. pannosa* was uninjured at Tortworth, but at Aldenham, North Mymms, and Thetford it was severely damaged, though not killed to the ground; *C. rugosa* var. *Henryi* was uninjured at Kew and at Burford; *C. multiflora* was not hurt at Enfield.

Cydonia cathayensis was unharmed at Tortworth.

Daphne Genkwa suffered no damage at Wisley, nor against the terrace wall at Clapham, Yorks.

Decaisnea Fargesii was slightly injured on a west wall at Horsham, but completely unharmed in the open at Enfield, Aldenham, Haslemere, and Killerton.

Deutzia discolor was uninjured both at Haslemere and at Stoneyford, while *D. Vilmorinea* was slightly injured at North Mymms.

Eleutherococcus Henryi was uninjured in the open at Kew and at Cambridge.

Eomecon chionantha was not damaged at Harrow Weald, but it was protected by having a piece of glass over the roots.

Euonymus sachalinensis was unhurt at North Mymms.

Euptelea Davidiana and *E. Francheti* were unhurt in the open at Kew, and the latter at Aldenham; *E. polyandra* was unhurt in the open at Kew, Haslemere, Aldenham, and in a sheltered bed at Cambridge.

Evodia vitaecarpa survived uninjured in an open bed at Cambridge.

Exochorda Alberti, from Turkestan, was unhurt at Crawley and Clapham, Yorks, as was *E.* × *macrantha* at St. Keverne.

Fraxinus mandschurica and *F. Mariesii* were uninjured at Tortworth.

Gleditschia Delavayi was not damaged at Haslemere, but at the Physic Garden, Chelsea, in an exposed situation, where it had stood four years, it was killed outright.

Gordonia anomala was so seriously damaged as to be only just alive at Hythe; *G. grandis* was also badly cut, but recovered.

Hedysarum multijugum had the points of the growths cut back at Chelsea.

Hydrangea Hortensia was unhurt at Whitby, and slightly damaged at Camberley and S. Ayrshire, but killed to the ground at Chelmsford, North Mymms, and Slough (young plants).

Hypericum chinense was killed to the ground at North Mymms and severely cut at Horsham, but at Haslemere the damage was but slight.

Ilex Pernyi received no injury at Burford and St. Keverne.

Illicium religiosum (= *anisatum*?) was uninjured at Camberley, where it has stood sixteen years, at Monreith, and at Clapham.

Incarvillea compacta was not damaged at Belvoir Castle, but *I. variabilis* was killed outright at Monreith, and *I. sinensis* at Camberley, but *I. grandiflora* was not damaged at Isleworth or at Monreith; *I. Delavayi* is reported as uninjured from Chelsea, Belvoir Castle, and Balmae.

Indigofera macrostachys was killed to the ground at Hythe but recovered.

Itea ilicifolia was uninjured at Kew.

Jasminum officinale, uninjured on a wall at Chelsea, had its branches severely cut back at Slough, and was slightly injured at New Galloway; *J. primulinum* died at Chester and on west walls at Nuneham Park and Foots Cray, and was killed to the ground even on a wall at Kew, Sutton Place, Crawley, and Belvoir Castle, but a plant on a south wall in South Ayrshire was only slightly damaged, a standard in the open at St. Keverne was but slightly damaged, and on south walls at Haslemere and at Killerton it was unhurt, as it was at Camberley.

Koelreuteria paniculata was badly cut at Aldersey and slightly at Wisley, but it quite escaped injury at Belvoir Castle, Colwyn Bay, and Tortworth.

Libocedrus macrolepis was killed outright at Kew.

Ligustrum Delavayanum was severely injured at Aldenham, as was *L. lucidum* at Aldenham, Brympton, Osterley Park, and North Mymms, and the variety *tricolor* at Aldenham; *L. yunnanense* was killed outright at Aldenham, while *L. strongylophyllum* was unhurt; the last two were unhurt at Horsham.

Liriodendron chinense was quite undamaged at Kew.

Lonicera Maackii proved perfectly hardy at Burford and Haslemere;

L. pileata at Chelsea and Aldenham; *L. Standishii* at Chelsea; *L. syringantha* at Clapham, Yorks; *L. thibetica* at Haslemere, and the beautiful *L. tragophylla* at Burford, Haslemere (on a north-west wall), Hinton Admiral, and St. Keverne; *L. Hildebrandtii* was killed to the ground at Hythe and killed outright at Mickleham, Abbotsbury, and Nuneham Park.

L. japonica was more or less damaged on a south wall at Aston Rowant and at Hever Castle, and *L. Halleana* suffered slightly at Slough.

Loropetalum chinense was killed at Camberley and at Nuneham Park, and badly damaged at Hythe, but escaped with little damage at Haslemere.

Magnolia Yulan is reported uninjured at Clapham, Yorks, and Whitby, and *M. nigra* and *M.* × *Soulangeana* at Belvoir Castle; *M. Delavayi* was killed in the open, but escaped on an east wall at Kew.

Meliosma myriantha was killed in an exposed position at Aldenham.

Michelia fuscata was slightly damaged on a wall at St. Keverne.

Osmanthus fragrans was unhurt at Clapham, Yorks, but was slightly damaged on a south-east wall at Haslemere.

Osteomeles anthyllidifolia had its branches killed back at Abbotsbury and Hythe.

Paeonia lutea was uninjured at Burford, and *P. Moutan* at Whitby, Clackmannan, and New Galloway.

Pertya sinensis sustained no injury in the open at Kew.

Pieris formosa was much damaged at North Mymms.

Pinus Armandi was uninjured at Cambridge.

Podophyllum versipelle was uninjured at Chelsea.

Polygonum multiflorum in an exposed position was badly damaged at Enfield.

Polythyrsis sinensis were killed in the nursery at Kew, but other plants are growing well there.

Poupartia Fordii survived at Kew.

Primula Cockburniana was uninjured at Sutton Place; *P. pulverulenta* suffered no damage at Sutton Place, Wisley, Killerton, St. Keverne, Harrow Weald, or Corstorphine; *P. Veitchii* was uninjured at Sutton Place and at Killerton.

Prunus Maximowiczii and *P. triloba* were not damaged at Belvoir Castle.

Pueraria Thunbergiana was uninjured at Hythe.

Rhododendron Fordii was much disfigured at Kew; *R. indicum* (*Azalea indica*) was uninjured at Belvoir Castle, and the var. *amoenum* and other forms at Kew, and the var. *Fosterianum* at the foot of the rockery at Hinton Admiral; *R. ledifolium* was slightly damaged at North Mymms; *R. sublanceolatum* died outright at Kew; *R. rubiginosum* was uninjured in the open at Haslemere, but at Kew it died in a damp place, but was unhurt in a drier situation, and *R. yunnanense*, planted in a low-lying place, lost all its leaves. New Chinese Rhododendrons at St. Keverne escaped quite unhurt.

Rhus Henryi and *R. sinica* were quite uninjured at Haslemere, where they have stood four years, but the branches of the latter were killed back at Wisley.

Rodgersia pinnata was uninjured at St. Keverne.

Rubus bambusarum was not harmed at Burford, Haslemere, Enfield, and Clapham, Yorks; *R. innominatus* and *R. flagelliflorus* suffered no damage at Burford and Haslemere, and *R. lasiostylus* at Burford, Enfield, and North Mymms.

Salvia japonica was killed outright at Cambridge in an open bed.

Saxifraga sarmentosa was slightly damaged at Chelmsford and severely so at Thetford.

Schizandra Henryi was uninjured in a fairly sheltered bed at Cambridge.

Schizophragma integrifolia was uninjured in the open at Kew.

Senecio tanguticus was uninjured at Belvoir Castle, and *S. Veitchianus* at St. Keverne, as was *S. Wilsonianus* at St. Keverne and Stoneyford.

Sinofranchetia sinensis proved perfectly hardy at Kew.

Sophora flavescens was killed to the ground at Burford, but *S. viciifolia* suffered no harm at Kew, Clapham, Yorks, and Cambridge on the east wall of the palm-house.

Sterculia platanifolia was killed to the ground in the open at Nuneham Park.

Sycopsis sinensis was not harmed in the open at Kew.

Syringa Giraldiana was uninjured at Haslemere, where it has grown for three years.

Tecoma grandiflora was unhurt at Osterley Park and Monreith.

Tetracentron sinense was uninjured in the open at Kew and at Cambridge.

Thalictrum dipterocarpum was uninjured at Burford and at St. Keverne.

Thuya elegantissima (=*T. orientalis*?) had its branches severely damaged at Slough.

Trachelospermum jasminoides was killed outright on a west wall at Nuneham Park, but suffered very little damage with a greater degree of frost at Hinton Admiral on a north wall, and at Hythe it had its branches rather badly damaged; *T. crocostomum* was unhurt on a wall at Kew.

Viburnum dilatatum was uninjured at Aldenham, as was *V. macrocephalum* on a wall at Belsay Castle, though at North Mymms many branches were killed; *V. odoratissimum* was unhurt at Gunton Park; *V. tomentosum plicatum* was uninjured in all situations at Clapham and Wisley, but had its branches badly damaged at Chelsea.

Vitis armata was uninjured at St. Keverne and at Enfield, as well as the var. *Veitchii*, and though *V. Henryana* died in Strathfieldsaye, it came through quite without damage at Hinton Admiral, Enfield, North Mymms (on a south wall), and Belvoir Castle; *V. heterophylla* was uninjured at Isleworth, as were *V. megalophylla* and *V. Thunbergii* at Enfield, Crawley, and Burford; *V. Cognettiae* was unhurt at Belvoir Castle, Whitby, East Sutherland, and Isleworth, as was *V. Thunbergii* at Belvoir Castle; *V. Thomsoni* was killed outright at Strathfieldsaye and killed to the ground at Enfield.

Wistaria multijuga seems, like *W. chinensis*, quite hardy.

Zanthoxylum schinifolium was not injured at Aldenham.

JAPAN.

Acanthopanax ricinifolium, ten years of age, was unhurt at Camberley.

Acers of various kinds from Japan were reported from many places, either unharmed or slightly injured.

Actinidia polygama was uninjured on the terrace wall at Clapham, Yorks, and *A. arguta* at Camberley, where it has grown seven years.

Aesculus turbinata was uninjured at Tortworth.

Akebia lobata was unhurt at Haslemere and at Enfield.

Aralia cordata was unhurt in the open at Clapham.

Aucuba japonica was severely injured in South Ayrshire, and slightly at Osterley Park and Slough.

Berberis Bealei was killed at Wisley, but uninjured at North Mymms; *B. Knightii* was killed to the ground at Tetbury, but uninjured against the terrace wall at Clapham; *B. japonica* was slightly damaged at Aldenham.

Betula Maximowiczii was uninjured at Osterley Park and Tortworth, as was *B. ulmifolia* at Tortworth.

Buddleia japonica, from the Lu-chu Is., was killed at Newbury.

Carpinus cordata was unhurt at Tortworth, as was *C. japonica*.

Cephalotaxus Fortunei was unhurt at Belvoir Castle, where the fastigiate form of *C. pedunculata* also escaped.

Cercidiphyllum japonicum was slightly damaged on a west wall at Horsham, but was unharmed at Haslemere, Killerton, and Tortworth.

Chimonanthus fragrans was slightly damaged at Wisley, but escaped injury on a south wall at Aldersey and Clapham.

Clematis paniculata was unharmed at Belvoir Castle.

Conandron ramondioides died, as usual, at Clapham.

Coriaria japonica was unhurt at North Mymms.

Cornus Kousa was unhurt at Horsham and Poolewe, and slightly damaged at North Mymms.

Corylopsis pauciflora was uninjured at Tortworth, and slightly damaged at North Mymms; *C. spicata* behaved in the same way.

Cryptomeria japonica was unhurt at Belsay Castle* and Wisley, but severely damaged at Isleworth.

Daphne odora was unharmed at Horsham and against the terrace wall at Clapham, Yorks, but slightly damaged at Thetford.

Daphniphyllum macropodium was unharmed at Belvoir Castle, but cut back at Crawley.

Dendropanax japonicum was slightly damaged at Haslemere.

Deutzia Sieboldiana was slightly damaged in the open at Wisley and Chelsea.

Diospyros Kaki was uninjured on a wall, but killed in the open at Kew.

Disanthus cercidifolia was unhurt at Killerton and Hatfield, but severely cut at Aldenham.

* A very fine tree 58 feet in height and 5 feet 10 inches in circumference at 4 feet high; another, a little shorter, in the same garden has a circumference of 6 feet 7 inches.

Elaeagnus glabra was slightly injured at Aldenham, and *E. reflexa* lost its leaves and had the young wood killed at Camberley; *E. multiflora* was unhurt at Belvoir Castle and Wisley.

Enkianthus japonicus was but slightly injured at Clapham, and not at all at Aldenham; *E. campanulatus* sustained no injury at Camberley or Burford.

Eriobotrya japonica, unhurt at Poolewe, had its leaves slightly seared at Hythe, Chelsea, Horsham, and Wisley, and its shoots badly cut at Nuneham Park and Belvoir Castle, but was killed at Chelmsford.

Fatsia japonica was unharmed at Dunrobin Castle, but the variegated form was killed at Corstorphine, where it had stood for eight years; the type was severely injured at Chelmsford and at Tetbury, but unhurt at Harrow Weald.

Hamamelis arborea was unhurt at Wisley and elsewhere, and *H. mollis* and *H. Zuccariniana* at Clapham.

Hydrangea paniculata was unhurt at Belvoir Castle, but killed at Gisburn.

Idesia polycarpa was severely cut at Abbotsbury.

Kerria japonica was slightly damaged at North Mymms, but unhurt in most places.

Larix leptolepis was unhurt at Osterley Park and *L. kurilensis* at Tortworth.

Lespedeza cyrtobothra was uninjured at Monreith.

Lycoris squamigera was unharmed at Enfield and Isleworth.

Lysimachia clethroides was killed at Mowbray Park, where other species were but slightly damaged.

Magnolia compressa was uninjured at Haslemere; *M. hypoleuca* at Tortworth; *M. Kobus* at Clapham; *M. parviflora* at Osterley Park and Harrow Weald; *M. salicifolia* and *M. Watsoni* at Clapham; *M. stellata* in many places.

Malouetia asiatica was killed at Abbotsbury.

Miscanthus gracillima was unhurt at Belvoir Castle.

Musa japonica was unharmed at Camberley.

Osmanthus Aquifolium was slightly damaged at Kew, where the variety *Ilicifolium* was uninjured, as it was at Aldersey; the latter was slightly damaged at Hever Castle and Isleworth.

Paulownia imperialis was uninjured at Horsham, slightly damaged at North Mymms, severely at Belvoir Castle, and killed to the ground at Chelmsford and S. Ayrshire.

Photinia variabilis (=*P. villosa*) sustained no damage at Aldenham and at Tortworth.

Pieris ovalifolia was unhurt at Belvoir Castle (where it has stood for twenty-eight years), at Alloa, and at Wisley.

Pittosporum Tobira was unharmed at Brympton House and on a south wall at Monreith, and only slightly damaged on a south-east wall at Haslemere, but more severely on a south-west wall at Horsham, and killed at Nuneham Park and Enfield.

Quercus serrata and *Q. variabilis* were uninjured at Tortworth.

Rhododendron dilatatum was unhurt at Kew, as was *R. thomsonii*, but *R. serpyllifolium*, which was uninjured at Killerton, was badly cut at Kew; *R. lanceolatum* was killed at Kew.

Rhodotypos kerrioides was unhurt at Clapham and Wisley.

Rodgersia podophylla was unharmed at Belvoir Castle.

Rubus phoenicolasius was severely injured at Belvoir Castle.

Schizocodon soldanelloides was uninjured at Camberley, as it was at Wisley.

Schizophragma hydrangeoides was severely damaged at Chelsea, but unhurt on a wall at Clapham.

Sciadopitys verticillata was uninjured at Camberley, as it was at Wisley.

Shortia uniflora was unhurt at Monreith.

Smilax Sieboldii was uninjured at Aldenham.

Stachyurus praecox was severely cut at Aldenham.

Stephandra Tanakae, severely cut at North Mymms, was unhurt at Aldersey, and had only the tips of the shoots damaged at Wisley, where *S. flexuosa* suffered no harm.

Stuartia Pseudo-camellia was uninjured at Harrow Weald and Aldenham, but was severely cut in a damp place at Aston Rowant, and slightly at Thetford.

Styrax japonicum was uninjured at Wisley, Camberley, Horsham, Harrow Weald, and Tortworth, and slightly damaged at Aldenham; *S. Obassia* was unharmed at Burford and Wisley.

Trachycarpus excelsus was unhurt at Camberley, Monreith (where a bed of seedlings two years old, in the open, was not damaged), and Belsay Castle, Belvoir Castle, Enfield, and Corstorphine.

Trochodendron aralioides was uninjured at Haslemere.

Viburnum macrophyllum was not harmed at Killerton, nor *V. Sieboldii* at Aldenham.

Zelkova acuminata was unhurt at Tortworth.

Himalayan Region.

Abelia triflora was slightly damaged on a wall at St. Keverne.

Aesculus indica suffered no damage at Tortworth in a shady dell, where it is doing well.

Agapetes buxifolia was killed to the ground at Hythe.

Berberis nepalensis was slightly cut in the open at St. Keverne.

Cedrus Deodara was unhurt at Isleworth, but suffered some damage in most places, as at Kew (where it lost most of its foliage), Aston Rowant (where the injury was peculiar, for the needles were lost for about six feet of the growth, the lower foot being uninjured and all above seven feet up), and at Slough, and still more at Byfleet.

Cotoneaster thymaefolia was slightly damaged at North Mymms: *C. Simonsii*, killed at Chelsea, where it had grown for nine years, was unhurt at Cobham and Wisley.

Cyananthus lobatus was unhurt at Belvoir Castle.

Damnacanthus indicus was killed to the ground at Aldenham, and completely destroyed at Thetford.

Desmodium tiliaefolium was killed to the ground at Enfield, but unhurt at Horsham (on a west wall) and at Clapham, Yorks.

Deutzia corymbosa was greatly damaged at North Mymms.

Ehretia macrophylla was cut back badly at Tortworth.

Fraxinus rhyncophylla was unhurt at Tortworth.

Gaultheria trichophylla was unhurt at Hornby Castle.

Hemiphragma heterophyllum was unhurt at Enfield, where it was protected by a light placed over the bed.

Holboellia latifolia was badly injured at Hinton Admiral, even thirty-year-old plants on walls.

Hypericum oblongifolium was killed to the ground at Enfield, and slightly damaged at Hinton Admiral and North Mymms; *H. patulum* was killed at North Mymms, killed to the ground at Hinton Admiral, Foots Cray, Enfield, and Osterley Park, but unhurt at Hornby Castle; *H. Moserianum*, a hybrid between *H. patulum* and the European *H. calycinum*, was killed to the ground at North Mymms and Thetford; *H. reptans* was killed to the ground at Thetford, though unhurt at Hornby Castle; *H. Hookerianum* was slightly damaged at Belvoir Castle.

Leycesteria formosa was killed to the ground at Wisley, Chelmsford, and North Mymms, much damaged at Thetford, but escaped injury at New Galloway.

Lonicera obovata was unhurt in the open border at North Mymms and at Clapham, Yorks.

Magnolia Campbelli escaped injury at Kew.

Parrotia Jacquemontiana was unhurt at Haslemere and at Clapham, Yorks.

Perovskia atriplicifolia had the young wood killed at Camberley and Thetford, and was killed to the ground at Aldenham, but escaped completely at Hythe, North Mymms (in the open), Killerton (in the open), and Aldersey (on a south wall).

Piptanthus nepalensis, unhurt at Aldersey and Monreith, was more or less damaged at Hever Castle and Thetford.

Polygonum vaccinifolium was severely damaged at Wimbledon, Sutton Place, and Thetford.

Rhododendron Anthopogon was unhurt at Kew; *R. arboreum* was slightly damaged at Wisley, but some plants were killed outright; at Crawley it was seriously damaged, but at Monreith and Harrow Weald it was unhurt; the variety of *Campbelliae* was unhurt at Kew; *R. barbatum* was unhurt at Kew and Monreith; *R. campanulatum* was not damaged at Kew, Harrow Weald, and Belvoir Castle, nor its variety *Wallichii* at Harrow Weald; *R. campylocarpum* escaped injury at Harrow Weald and Clapham, Yorks; *R. ciliatum*, uninjured at Kew, was killed to the ground in sheltered places at Wisley; *R. cinnabarinum* was unhurt at Kew, Belvoir Castle, and Monreith; *R. Dalhousiae* was unhurt at Poolewe; some plants of *R. Falconeri* were killed at Wisley, and others, more sheltered, were only slightly harmed, as they were at Crawley and Colwyn Bay; at Belvoir Castle

and Poolewe it escaped injury entirely; *R. fulgens* was unhurt at Kew and Clapham, Yorks; *R. glaucum* has proved quite hardy at Kew, but was killed to the ground at Wisley, and completely on the rockery at Foots Cray; *R. Aucklandii* was unhurt at Belvoir Castle and Poolewe, but severely cut at Crawley; the hybrid *R. kewense* proved quite hardy at Belvoir Castle; *R. Keysii* died at Crawley; *R. lepidotum* was unhurt at Kew; *R. niveum* was unhurt at Kew and Belvoir Castle, and suffered slightly at Haslemere; *R. Nuttallii* was unhurt at Poolewe; *R. triflorum* was killed to the ground at Crawley and Wisley (though some plants escaped with serious injury to the branches), and at Kew the damage was severe; *R.* × *Victorianum* (*Dalhousiae* × *Nuttallii*) was uninjured at St. Keverne.

Roscoea purpurea was unhurt at Camberley, where it has grown for nine years.

Spiraea flagelliformis had the tips of the growths cut at Wisley.

Styrax serrulatum virgatum was unhurt at Belvoir Castle, where it has stood for fourteen years.

Symplocos crataegoides died in the open at Nuneham Park.

Stranvaesia glaucescens was killed to the ground at Thetford.

Trachycarpus Martinanus was unhurt at Haslemere.

East Indies and Tropical Asia.

Acacia eburnea, newly planted, died at Abbotsbury.

Broussonetia papyrifera laciniata, three years old, was killed to the ground at Aldenham, but stronger plants and other varieties were uninjured there.

Campanula pallida (=*C. colorata*) was killed at Hornby Castle.

Clethra canescens was uninjured at Crawley, but at Abbotsbury it died after surviving the winter.

Deeringia celosioides, growing on a west wall of the Cactus House, was killed to the ground at Cambridge, but grew up strongly after.

Dracaena atropurpurea was killed to the ground at Abbotsbury.

Ehretia serrata was badly cut at Abbotsbury, Cambridge, and Tortworth, and newly transplanted plants were slightly damaged at Haslemere.

Jasminum humile (young) was killed to the ground at Slough, but on a wall at Chelsea both it and *J. odoratum* were unharmed.

Perhaps the point calling for most particular emphasis with regard to the foregoing returns is the hardiness of the plants recently introduced from Central China. The efforts made during the past decade to obtain new plants from the little-known districts of Central Asia have led to the enrichment of our gardens with many beautiful hardy shrubs which appear to be less affected by cold than some of our common natives, and many shrubs hitherto commonly grown.

Though a knowledge of the district from which a plant is derived is some guide as to whether it is likely to prove hardy in our climate or not, yet there are some curious apparent contradictions, *e.g.* *Choisya ternata*, from Mexico, suffered hardly at all (pp. 369 and 372).

whereas practically all other Mexican shrubs were either killed or severely damaged wherever the cold was severe and they had no special protection. It is, therefore, clearly worth while to try whether plants from districts which have not yielded many hardy plants so far will stand the cold of our winters. The apparently delicate *Helxine Soleirolii* from Corsica and Sardinia, which is often grown in stoves, is another instance of a plant native where frosts are rare, which has proved capable of surviving such severe cold as that experienced at Wisley and Camberley, possibly partly because covered by snow, though it should be noted that the grass thermometer registered zero at Wisley *under the snow*.

It is a noticeable fact that, while the habit, general character, and structure of a plant are excellent guides to the cultivator as to its requirements of light and water—the two factors that are probably the most important in determining its distribution over small areas—yet the one condition which is most important in determining the distribution of a plant over wide areas of the earth's surface, viz. temperature, leaves no mark upon the plants—there is nothing whatever in the general appearance and structure of a plant to act as a trustworthy guide as to whether it will be capable of withstanding low temperatures or not.

The natural affinities of plants form a rather better guide, for there are some families which contain no members capable of withstanding low temperatures; but here again the indication will serve only in some cases, for there are many instances of families, and even genera, of world-wide distribution, and not a few where the majority of the species are restricted to tropical climates but have some representatives straying into countries where the winter temperature falls very low.

To acclimatize plants has long been an aim of keen horticulturists. Sir Joseph Banks, P.R.S., in a paper read on December 5, 1805, before our Society,* said: "Respectable and useful as every branch of the horticultural art certainly is, no one is more interesting to the public, or more likely to prove advantageous to those who may be so fortunate as to succeed in it, than that of *inuring plants*, natives of warmer climates, to bear without covering the ungenial springs, the chilly summers, and the rigorous winters by which, especially for some years past, we have been perpetually visited." And he proposed the task of raising shrubs liable to be damaged by frost from seeds produced in this country, instancing, among others, the Bay, the Laurel, Oranges, Myrtles, Laurustinus, Cypress, Phillyrea, Alaternus, and Arbutus. There is, so far as we have been able to discover, no record of the results he obtained by sowing seeds of Laurels and Myrtles, but it is evident that they are as liable to damage to-day as they were then. The common laurel is as much subject to being cut by frost as when Master Cole, who introduced it to his garden at Hampstead, before Parkinson published his *Paradisus Terrestris* in 1629, "cast a blanket over the top" of it in frosty weather to protect it; and so we might say of many others. The common potato is no more hardy after cultivation

* *Trans. Hort. Soc. of London*, i. (1807-12), pp. 21-25.

here for more than three hundred years than when it was introduced—two or three degrees of frost are sufficient to destroy its leaves—and this in spite of several generations having been raised from seed; runner and French beans and vegetable marrows are the same now in this respect as when they were introduced; indeed, in the case of beans definite selection of those which withstood frost better than others of the same variety and the continuance of the race by seed saved from these survivors has not yielded a race one whit hardier than the species was when it first came to this country. Now and then examples are given of plants surviving under circumstances where others of the same species are killed by frost;* but these instances are few, and it would seem that the permanent change of the character of a plant so that it will withstand greater degrees of cold than when it was first introduced is at present beyond our powers to induce. We have no authentic instance of the acclimatization of a plant which proved tender when first grown. It would seem that the plant's relation to temperature depends in the main upon the nature of its protoplasm.

There is little doubt that the extent of the damage done was greater than it otherwise would have been in some places because of the continuous mild weather immediately preceding the first sharp spell in December. The reports state that several plants kept on growing when, under cooler conditions, growth would normally have ceased. It cannot, however, be said that in the dry soil at Wisley this was the case; on the whole there the summer's growth ripened fairly well and yet many plants suffered.

It seems certain, however, that plants which from their position in the garden are encouraged to continue long in growth, or to make growths slow to ripen, will be the ones most likely to fall victims to extremes of cold. In other words, parts of plants in which the protoplasm is in an active state are more likely to succumb to low temperatures than those in which the protoplasm has gone slowly to rest. Protoplasmic activity is always associated with abundant supplies of water, and so soft and sappy or ill-ripened wood is the first to suffer. The behaviour of winter vegetables during the period is instructive. In many gardens they were completely destroyed, but where it was possible for comparisons to be made between those which had been encouraged to continue growth late in the season by the application of nitrogenous manures, and others that had gone more or less to rest after their first growth-period was finished, it was invariably found that the latter suffered less and sometimes escaped altogether (see, *e.g.*, p. 77). It is probably on account of a factor such as this that some of the rather curious differences in behaviour reported concerning a few of the plants mentioned above are due. Some of them, because of greater shelter or a more abundant water supply, kept on growing longer in the autumn than their neighbours and suffered greater damage.

* "I know of no well-authenticated instance of plants which have acquired hardiness after long cultivation in a colder country. I have cases in my own garden this winter, amongst which I may mention *Eucalyptus Gunnii*, of which seedlings raised from Scotch-grown trees have proved more tender than seedlings raised from trees in the South of England, and I think that this is due to hereditary constitutional debility."—H. J. Elwes in litt. 1909.

No doubt the immunity enjoyed by bulbous and most herbaceous plants was due to the short duration of the frost and the little depth to which the earth became really frozen. [At Wisley the earth-thermometer at one foot deep did not register lower than 33.9° during the whole winter.] Probably, too, the covering of snow, which was very general, was of some preservative value to the herbaceous plants, though, so far as actual cold goes, it is doubtful whether it is of much assistance, for the grass thermometer at Wisley, covered with snow, registered zero on December 30. Kjellman* has shown that snow affords but slight protection against cold itself, but on the other hand its protective power against *sudden changes* of temperature and against *loss of water* by transpiration is great. Coverings of straw, etc., act in the same way, and it is interesting, too, to notice that practically all the structures of plants to which protective powers against cold have been ascribed are really devices for checking loss of water, and further, that we cannot recognize in any of those two hundred or so plants which are able to withstand the rigours of the winter at Yakutsk and Verkhoyansk, where the temperature sometimes falls to −60° C., any structural protective devices at all.

The question of the cause of death through frost is a very interesting one, a very difficult one, and one that has been the subject of much speculation. Dr. Lindley gave a very full account of the state of knowledge upon this point in the report already referred to,† but the best recent review of the subject is that of Professor F. F. Blackman in the *New Phytologist*, vol. iii. Nos. 9 and 10, pp. 354-362.

We can here give only a brief abstract of this excellent review and refer those interested to it and to the original papers upon which it is based for details.

It has long been held that the fatal disorganization of the protoplasm takes place *on thawing*, and that if thawing proceeds slowly a plant will recover from exposure to cold which would otherwise have proved fatal. This Molisch has ingeniously disproved and has shown that only in exceptional instances does the *rate* of thawing "make any difference to the question of death or recovery."

The disorganization of the protoplasm may be due to the withdrawal of water into the intercellular spaces where it freezes, and the generally accepted theory until recently was that this drying-up of the protoplasm was the direct cause of death; but in 1905 Mez suggested, and gave reasons for his theory, that for every mass of protoplasm there was a fatal minimum temperature, and in 1906 Gorke brought to light an entirely new factor. He found that as the water is withdrawn from the cells on freezing, the soluble salts become more concentrated and act upon the soluble proteids of the cell, causing them to become insoluble. He showed that the temperature required to bring about the precipitation of the soluble proteids of plants which suffered easily from cold was much higher than in the case of very resistant plants,

* *Aus dem Leben der Polarpflanzen.*
† *Trans. Hort. Soc. of London*, vol. ii. p. 299.

and there seems little doubt that the protoplasm is affected in a similar way to the soluble proteids. Thus death from cold would appear to be due to the alteration of the proteids due to the concentration of salts in the sap, the result of the withdrawal of water into the intercellular spaces.

It may be pointed out, before leaving this part of the subject, that the death of plants may be due to the drying process brought about in a slightly different way. Strong winds or bright sun acting on foliage of plants in a frozen soil causes them to lose water which cannot be replaced, since the soil is to all intents and purposes dry—the plants cannot get the water locked up in it.

Lidforss has studied the plants which in Sweden retain green foliage the winter through, and though he finds in the plants no structural protective devices against cold, yet there is one characteristic possessed by all, viz. that while their leaves in summer contain abundant starch, in cold weather this is replaced by sugar and sometimes by oil, which in spring is reconverted into sugar. He showed that the leaves of Oleander when saturated with a sugar solution did not suffer at temperatures which were fatal to the normal leaves, thus proving that the presence of much sugar in the sap was a protection to the plant. Lidforss' work affords an explanation to a number of apparently curious facts, such as frost-injury being more severe on the sunny side of trees, the greater amount of injury following a frost succeeding bright warm weather, and so, therefore, brings into line a number of apparently isolated effects, as a true theory should.

The effect of the presence of sugar would be to retard the freezing, but particularly to check the precipitation of the proteids to which Gorke attributes death through cold—and this effect has been experimentally demonstrated.

There are instances of sugar-containing plants which fall easy victims to cold, such as the beet, and, therefore, if the theory propounded by Lidforss be the true one, we are again forced to the conclusion that cold-resistance depends not only on the power of the plant to produce such protective substances as sugar and oil in its cells, but upon the specific constitution of the protoplasm itself.

[The full returns made, upon which this report is based, are being preserved, and it is hoped that Fellows will, as opportunity occurs, inform us of the behaviour of newly introduced plants under trying circumstances, so that the records may be kept up-to-date.—F. J. C.]

NOMENCLATURE OF MULTIGENERIC ORCHID HYBRIDS.

THE question of the nomenclature of horticultural varieties and of hybrids of garden plants has been a vexed one for many years, and perhaps particularly so in relation to orchids. In view of the fact that the raising of hybrid orchids connecting *many* genera is now probable (one hybrid connecting four genera is already in existence, and there is no apparent reason why others should not be raised combining all the genera in the respective groups—see list appended), the Orchid Committee of the Royal Horticultural Society considered that the time had arrived when some definite system of nomenclature, which should be at once simple, euphonious, and distinctive, should be adopted, internationally if possible.

To this end the Council appointed a Committee "to consider the question of the nomenclature of multigeneric orchid hybrids, to collect evidence upon the same, and, if possible, to make recommendations concerning it."

The Committee consisted of the following gentlemen: Mr. J. Gurney Fowler (Chairman), Messrs. N. C. Cookson, de Barri Crawshay, J. O'Brien, V.M.H., and H. J. Veitch, F.L.S., V.M.H. (members of the Orchid Committee), with Dr. A. B. Rendle, M.A., F.R.S., F.L.S., Messrs. E. A. Bowles, M.A., F.L.S., F.E.S., W. Fawcett, B.Sc., F.L.S., C. C. Hurst, F.L.S., A. Rolfe, A.L.S., and F. J. Chittenden, F.L.S. (Secretary), (members of the Scientific Committee).

Several meetings were held, and the chief difficulty was found to surround the question of the generic name. On this point the following suggestions were made [the sentences in square brackets following the respective suggestions represent the opinion of the Committee upon each]:—

1. That the name consist of parts of the names of the genera which enter into the composition of the hybrid—the system at present in use (see list appended).

   [This method will lead to the formation of such unwieldy names as Dialaeliocattphronitis and Brassolaeliocattleysophroschomboepidialeptotes.]

2. That a consonant be chosen to represent each of the genera used in producing the hybrid as B for Laelia, C for Cattleya. D for Sophronitis, and that these be followed by the vowel "a" when the genus is used once, "e" when it is used twice, and so on, as Dabaca for Sophronitis × Laeliocattleya, and Dabeca for Sophrolaelia × Laeliocattleya.

   [It is thought that the names thus formed would not be euphonious or sufficiently distinct.]

3. That one letter, preferably the initial letter, should be chosen to represent each genus used in hybridizing: thus L for Laelia, C for Cattleya, S for Sophronitis, and that these letters should be used to form the names of the resulting hybrids. Connecting vowels when necessary should be taken from the initial vowels, and the letter "y" should be used as a vowel sound between the components denoting the two sets of parents. Thus "Lysoc" would denote the product of Laelia × Sophrocattleya.

   [The names thus formed would seldom be euphonious, and the method of formation would not always prove sufficiently simple to grasp.]

4. That the name of one of the genera entering into the composition of the hybrid be retained for it, as is the practice in naming natural hybrids in other groups of plants, *e.g.* in the Gramineae (see Rules of Nomenclature, Vienna Congress, 1905, Art. 32).

   [The name would then lack distinctiveness.]

5. That the name be a commemorative one with a conventional ending, such as "ara" or "orch," as Lawrenceara or Lawrenceorch.

   [The former ending is considered the more euphonious.]

6. That the name be a commemorative one with the syllable "hyb" prefixed to indicate the hybrid origin, as Hyblawrencea.

   [While distinctive, the constant repetition of the syllable "hyb" would be likely to lead to confusion, and would be the reverse of euphonious.]

These suggestions and comments, together with some dealing with cognate matters, were sent in January 1909 to well-known botanists and orchid specialists all over the world, and when the replies received were considered it was found that the large majority were in favour of the adoption of Suggestion No. 5.

A few other suggestions on the subject were received, as a rule involving slight modifications of those set out above, and carefully considered by the Committee, who finally drew up the following recommendations and submitted them to the Council, who approved them subject to their ratification by the International Congress of Horticulture which met at Brussels in April 1910.

The whole question of the nomenclature of garden plants came under consideration at that Congress, and a brief outline of the principal findings is given in the report of the deputation from the Society (see p. xcvi.). The rules of nomenclature agreed to at the Congress are not yet published, but so far as can be ascertained there is among them nothing repugnant to the recommendations made by the Committee and approved by the Council.

RECOMMENDATIONS ON THE NOMENCLATURE OF ORCHID HYBRIDS.

1. The name of every orchid hybrid should consist of two parts, viz. a generic and a specific name, as at present.

2. The existing bigeneric and trigeneric combinations used as generic names should be maintained (see list appended).

It is desirable that these names should be written without hyphens.

3. Future generic names of hybrids combining two genera should be formed by combining parts of the names of the genera combined in the hybrid.

4. Future multigeneric hybrids (combining three or more genera) should be given a purely conventional name consisting of the name of some person eminent as a student or grower of orchids, terminated by the suffix "*ara*."

5. A separate generic name should be coined for each distinct combination of genera.

Thus

Brassocattleya × *Epilaelia*, and
Brassodendrum × *Laeliocattleya*, and
Brassolaelia × *Epicattleya*,

would all be known by one name—*e.g. Adamara*—while a second name—*e.g. Linneara*—would need to be coined for

Dialaelia × *Brassocattleya*,

and this name would stand for all combinations of the four genera,

Diacrium, *Laelia*, *Brassavola*, and *Cattleya*.

6. The specific name should preferably be of the Latin form, and should in all cases be preceded by the sign × ; where necessary a varietal name may be attached.

This suggestion is made in order that combinations such as

Laeliocattleya × 'Doris' *superbissima*

may be avoided.

7. Every endeavour should be made to secure the adequate registration of the parentage of all hybrids, so that there may never be any doubt concerning the combinations indicated in the names.

8. It is not desirable that existing names should be changed.

The Committee feels sure that by adopting the recommendations set forth above, simple, euphonious, and distinctive names may be coined which will be convenient for ordinary use and not liable to be confused with existing generic names.

LIST OF GENERIC NAMES OF INTERGENERIC HYBRIDS AT PRESENT IN EXISTENCE.

Group	Parent Genera		Hybrid
1.	Anguloa	Lycaste	Angulocaste
2.	Anaectochilus	Haemaria	Anaectomaria
	Dossinia	,, ,,	Dossinimaria
	Macodes	,, ,,	Macomaria
3.	Chondrorhyncha	Zygopetalum	Chrondropetalum
	Batemannia	,, ,,	Zygobatemannia
	Colax	,, ,,	Zygocolax
	Aganisia	,, ,,	Zygonisia
4.	Cochlioda	Miltonia	Miltonioda
	,,	Odontoglossum	Odontioda
	,,	Oncidium	Oncidioda
	Miltonia	Odontoglossum	Odontonia
5.	Calanthe	Phaius	Phaiocalanthe
	Cymbidium	,,	Phaiocymbidium
6.	Brassavola	Cattleya	Brassocattleya
	,, ,,	Epidendrum	Brassoepidendrum
	,, ,,	Laelia	Brassolaelia
	Diacrium	Cattleya	Diacattleya
	,,	Laelia	Dialaelia
	Cattleya	Epidendrum	Epicattleya
	Diacrium	Epidendrum	Epidiacrium
	Laelia	,, ,,	Epilaelia
	Sophronitis	,, ,,	Epiphronitis
	Laelia	Cattleya	Laeliocattleya
	,,	Leptotes	Leptolaelia
	Schomburgkia	Cattleya	Schombocattleya
	Sophronitis	,,	Sophrocattleya
	,,	Laelia	Sophrolaelia

TRI-GENERIC HYBRIDS.

6.	Brassavola	Cattleya	Laelia	Brassocattlaelia
	Sophronitis	,,	,,	Sophrolaeliocattleya

QUADRI-GENERIC HYBRIDS.

6.	Sophronitis	Brassavola	Cattleya	Laelia	Not yet bloomed or named.

[NOTE.—The foregoing recommendations may be subject to slight alterations when the text of the findings of the Brussels Conference Congress appears.]

THE SOCIETY'S WELCOME TO JAPANESE HORTICULTURISTS AND VISITORS IN LONDON FOR THE JAPAN-BRITISH EXHIBITION, 1910.

In recent years there has been a very marked *rapprochement* between the people of this country and the people of Japan, just in proportion as a truer knowledge and understanding of each by the other has broadened and deepened; and gardeners, perhaps more than any other particular class, have been indebted to the Japanese for ideas and expressions in plant life and for the unequalled floral wealth they have contributed to English gardens. The President and Council therefore decided to seize the opportunity of the Japan-British Exhibition to organize an official welcome to the representatives of Japan, and so express a cordial appreciation of Japanese gardening skill on the part of all British gardeners. In order to make this expression of appreciation as forcible as possible two plans were adopted. The first was to inspect and adjudicate upon the merits of the Japanese Gardens at the Exhibition; the second was to entertain the Japanese Ambassador, Commissioners to the Exhibition, and the Japanese gardeners then in London, at a commemoration luncheon at the Society's Holland House Show.

Accordingly on June 30 a Committee of Judges, including the President, Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., &c., Sir Frank Crisp, Messrs. H. J. Veitch, V.M.H., J. Hudson, V.M.H., W. A. Bilney, E. White, and the Rev. W. Wilks, M.A., examined the gardens and allied exhibits and awarded Silver Cups as follows:—

To Mr. Keijiro Ozawa, Tokyo, for the design of the "Garden of Peace" and the "Garden of the Floating Islands."

To Mr. Hannosuke Izawa, Tokyo, for the construction of the "Garden of Peace" and the "Garden of the Floating Islands."

To the Taiko Yen, Shiba Park, Tokyo, for the design and construction of two miniature gardens.

To the Yokohama Nursery Company, Yokohama, for a collection of dwarf trees in pots.

To the Yokohama Nursery Company, Yokohama, for a specimen dwarf tree (*Thuya obtusa*, golden variety, said to be 125 years old).

To Mr. Shinsuke Hayashi, Kyoto, for a pair of bronze garden lamps.

To Mr. Ikenobo Senkei, Kyoto, for an imitation dwarf Pine used in ceremonies.

To Nippon Yusen Kaisha, for a garden of artificial flowers.

To the Girls' Technical School, Tokyo, for an arrangement of artificial flowers.

The following letters acknowledging these Cups were received:—

21 Addison Road, Kensington, W.: July 23, 1910.

DEAR SIR TREVOR,—I am enclosing you herewith the letters gratefully acknowledging receipt of the beautiful Cups your Society has been good enough to award to our Horticultural Exhibitors at the Japan-British Exhibition.

Permit me to renew my thanks for the interest you have taken and the encouragement you have given to our Exhibitors.

Yours faithfully,
HIKOJIRA WADA.

July 22, 1910.

SIR,—We beg to tender our hearty thanks through you to the Royal Horticultural Society for the interest it has shown in the Japanese Horticultural Exhibits at the Japan-British Exhibition and for the encouragement it has given us by its generous award of the Silver Cups, which we have received through the Commissioner-General, Mr. Hikojira Wada.

We shall always treasure these mementos and shall use our best endeavours to continue to deserve the praise of so important a Society.

We are, Sir,
Yours obediently,
JIRO HARADA, for K. Ozawa.
H. IZAWA.
TAIKO YEN.
S. SUZUKI, for the Yokohama Nursery Co.
K. NIWA, for Ikenobo Senkei.
K. NIWA, for S. Hayashi.
F. OGURI, for Nippon Yusen Kaisha.
S. TEGIMA, Director of the Girls' Technical School, Tokyo.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H.,
President of the Royal Horticultural Society.

THE LUNCHEON.

The Complimentary Luncheon was given on the second day of the Society's Summer Show at Holland House, July 6, 1910, the President, Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., &c., occupying the chair, when the following Japanese and English gentlemen met in the luncheon tent:—

His Excellency Monsieur Takaaki Kato, Ambassador, 4 Grosvenor Gardens, S.W.

His Excellency Baron Oura, Minister of Agriculture and Commerce and President of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

His Excellency Prince Iyesato Tokugawa, Chairman of the House of Peers.

Mayor Yukib Osaki, Mayor of Tokyo, and Member of House of Representatives, Queen Anne's Mansions, St. James' Park, S.W.

Hikojira Wada, Esq., Commissioner-General of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

Enjiro Yamaza, Esq., Councillor of Japanese Embassy, 21 Basil Mansions, Knightsbridge, S.W.

Shigenobu Hirayama, Esq., Court Councillor to the Imperial Household, 36 Clanricarde Gardens, W.

Dr. Bunji Mano, Director of the Bureau of Industrial Education, Department of Education, Ashbourne Hotel, 135 Cromwell Road, South Kensington, S.W.

Naohiko Masaki, Esq., Director of the Tokyo Fine Art School, "Midhurst," Petersham Road, Richmond, Surrey.

Yoshiharu Tadokoro, Esq., Councillor to the Department of Education, 19 Trebovir Road, Earl's Court, S.W.

Dr. Yasushi Tsukamoto, Professor of the Tokyo Imperial University, 5 Fernshaw Road, Fulham, S.W.

Jujiro Sakata, Esq., Consul-General, 72 Kensington Park Road, Notting Hill Gate, W.

Count Kozui Otani, 38 Hyde Park Gate, W.

Baron Ryochi Kujo, 38 Hyde Park Gate, W.

Baron Hachiroyemon Mitsui, Coburg Hotel, Grosvenor Square, S.W.

Count Shigetsune Kamei, Master of Ceremonies, Imperial Household Department, 35 Earl's Court Square, S.W.

Viscount Sukehiro Ito, 39 Redcliffe Square, S.W.

Baron Bunkichi Ito, Staff of the Imperial Japanese Government Commission to the Japan-British Exhibition, c/o Dr. A. M. Gossage, 54 Upper Berkeley Street, Portman Square, W.

Yeitaro Okamoto, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

Harushige Yamawaki, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 139 Holland Road, Kensington, W.

Tei Hori, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

Commander K. Kato, Naval Attaché to Japanese Embassy, 24 Campden Hill Court, Kensington, W.

Kenkichi Yoshizawa, Esq., First Secretary of Japanese Embassy, Japanese Embassy Office, 1 Lygon Place, Ebury Street, S.W.

Takeo Mitsumatsu, Esq., Secretary of the Department of Agriculture and Commerce, 19 Trebovir Road, Earl's Court, S.W.

Ushitaro Beppu, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

Tokutaro Sakai, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 21 Addison Road, Kensington, W.

Major Hata, Assistant Military Attaché to Japanese Embassy, Japanese Embassy Office, 1 Lygon Place, Ebury Street, S.W.

Yojiro Shibata, Esq., Secretary of Japanese Embassy, Japanese Embassy Office, 1 Lygon Place, Ebury Street, S.W.

Koki Hirota, Esq., Secretary of Japanese Embassy, Japanese Embassy Office, 1 Lygon Place, Ebury Street, S.W.

Kinichi Komura, Esq., Attaché to Japanese Embassy, 32 Ebury Street, S.W.

Ikaku Kurahara, Esq., Member of the House of Representatives.

Dr. Gimi Hiraga, Councillor to the Imperial Japanese Government Commission to the Japan-British Exhibition.

Seikei Sengoku, Esq., Assistant Secretary of the House of Peers.

Toshio Shimada, Esq., Representative of the City of Tokyo.

Takuma Dan, Esq., Managing Director of Mitsui & Co., Coburg Hotel, Grosvenor Square, S.W.

Dr. Rokuichiro Masujima, c/o Mrs. Garrod, 72 Compayne Gardens, West Hampstead, N.W.

Keiichiro Yasukawa, Esq., c/o Mr. E. Yamaza, 21 Basil Mansions, Knightsbridge S.W.

Kinosuke Fukutome, Esq., Expert of Formosan Government, 95 Oxford Gardens, North Kensington, W.

Hirotaro Ando, Esq., Agricultural Expert of the Department of Agriculture and Commerce, 19 Trebovir Road, Earl's Court, S.W.

Yasunosuke Kagami, Esq., Principal of the Horticultural School of Chiba Prefecture, 19 Trebovir Road, Earl's Court, S.W.

Sannosuke Osawa, Esq., Professor of the Tokyo Fine Art School, 26 Cathcart Road, South Kensington, S.W.

Naozo Kanzaki, Esq., Commissioner of Japanese Section of Japan-British Exhibition, 28 Holland Park Gardens, Kensington, W.

Harutomo Akimoto, Esq., Staff of the Imperial Japanese Government Commission to the Japan-British Exhibition, "Midhurst," Petersham Road, Richmond, Surrey.

Jiro Harada, Esq., Staff of the Imperial Japanese Government Commission to the Japan-British Exhibition, 24 Woodstock Road, Bedford Park, W.

Atsuzane Hayao, Esq., Ashbourne Hotel, 135 Cromwell Road, South Kensington, S.W.

Yeijiro Ono, Esq., Manager of London Branch of Bank of Japan, 53 Campden Hill Court, Kensington, W.

Senjiro Watanabe, Esq., Manager of London Branch of Mitsui & Co., "The Old Hall," 4 Kidderpore Avenue, Hampstead, N.W.

Toyotaro Isomura, Esq., 6 Rosslyn Mansions, Goldhurst Terrace, South Hampstead, N.W.

Konojyo Tatsumi, Esq., Manager of London Branch of Yokohama Specie Bank, "Minister Lodge," 8 Lingham Court Road, Streatham Hill, S.W.

Renjiro Negishi, Esq., Manager of London Branch of Japan Mail Steamship Co., 111 Broadhurst Gardens, West Hampstead, N.W.

Testujiro Shidachi, Esq., 186 Holland Road, Kensington, W.

Matsuoto Mayeda, Esq., Architect, the Imperial Japanese Government Commission to the Japan-British Exhibition, 26 Cathcart Road, South Kensington, S.W.

Hisataka Saito, Esq., Architect, the Imperial Japanese Government Commission to the Japan-British Exhibition, 26 Cathcart Road, South Kensington, S.W.

Teijiro Mizoguchi, Esq., Assistant Director of the Art Department, Imperial Household Museum, "Midhurst," Petersham Road, Richmond, Surrey.

Takuzo Otsuka, Esq., Managing Director of the Japan Exhibitors' Association to the Japan-British Exhibition, 36 Clanricarde Gardens, W.

Hiromichi Shugio, Esq., Adviser to the Japan Exhibitors' Association to the Japan-British Exhibition, 36 Clanricarde Gardens, W.

Keiichiro Kume, Esq., Professor of the Tokyo Fine Art School and the Tokyo Higher Commercial School, and Director of the Japan Exhibitors' Association to the Japan-British Exhibition, 36 Clanricarde Gardens, W.

Shinichi Kasuga, Esq., Fishery Expert of the Department of Agriculture and Commerce, 19 Faraday Road, Horn Lane, Acton, W.

Keisuke Niwa, Esq., Director of the Kyoto Commercial Museum, 28 Holland Park Gardens, W.

Yojiro Kuwabara, Esq., Staff of the Imperial Japanese Government Commission to the Japan-British Exhibition, "Midhurst," Petersham Road, Richmond, Surrey.

Shigeru Itami, Esq., Staff of the Imperial Japanese Commission to the Japan-British Exhibition, 4 Harley Road, Hampstead, N.W.

Hannosuke Izawa, Esq., Expert Gardener, the Imperial Japanese Government Commission to the Japan-British Exhibition, c/o Mr. Baxter, 18 Paddenswick Road, Ravenscourt Park.

Risaburo Oda, Esq., Vice-President of Hamamatsu Chamber of Commerce, 189 Goldhawk Road, Shepherd's Bush, W.

Rintaro Yamasaki, Esq., Representative of Tokyo Municipality, 14 Farrington Square, W.C.

Kanroku Kubota, Esq., Representative of the Red Cross Society of Japan, 57 Clarendon Road, Holland Park Avenue, W.

Japanese Press.

"Jiji Shimpo."—Seizo Hamada, Esq., 16 Cotleigh Road, West Hampstead, N.W.

"Yorodzu Choho."—Rentaro Kayahara, Esq., 39 Colville Terrace, Bayswater, W.; Itsuo Hashimoto, Esq., 37 Linden Gardens, Bayswater, W.

"Yamato Shimbun."—G. H. Kozuka, Esq., 51 Wood Lane, Shepherd's Bush, W.

"Kobe Yushin Nippo."—Ryubi Tanaka, Esq., 47 Canonbury, Highbury Square, N.

"Osaka Mainichi Shimbun."—Kiyoshi Kikuchi, Esq., 28 Tedworth Gardens, Chelsea, S.W.

"Asahi Shimbun."—Manjiro Hasegawa, Esq., 180 Holland Road, Kensington, W.

The Right Hon. Lord Blyth, Vice-President of the Japan-British Exhibition.

Sir Thomas Elliott, K.C.B., Secretary to the Board of Agriculture.

Sir Daniel Morris, K.C.M.G., D.Sc., V.M.H., Member of the Council of the R.H.S.

Sir Albert Rollit, D.C.L., LL.D., Litt.D., Member of the Council of the R.H.S.

Sir Jeremiah Colman, Bart., V.M.H., Vice-Chairman of the Orchid Committee of the R.H.S.

His Worship the Mayor of Westminster (the Rev. A. Harcourt Hillersdon).

Lieut.-Col. D. Prain, F.R.S., Vice-Chairman of the R.H.S. Scientific Committee and Director of the Kew Gardens.

Prof. W. Bateson, M.A., F.R.S., V.M.H., Member of the R.H.S. Scientific Committee and Director of the Innes Horticultural Institution.

Dr. A. B. Rendle, F.R.S., F.L.S., Member of the R.H.S. Scientific Committee and Keeper of the Department of Botany, Natural History Museum.

Mr. Spencer Pickering, F.R.S., Member of the R.H.S. Scientific Committee and Director of the Duke of Bedford's Experimental Fruit Farm at Woburn.

Mr. Imre Kiralfy, Commissioner-General, Japan-British Exhibition.

Mr. Charles Kiralfy, Deputy Commissioner-General, Japan-British Exhibition.

Mr. Arthur W. Sutton, V.M.H., Member of the R.H.S. Scientific Committee.

Mr. A. Clutton Brock, Fellow of the R.H.S.

Mr. N. N. Sherwood, Fellow of the R.H.S.

Mr. Edward White, Hon. Sec., International Horticultural Exhibition, 1912.

Mr. J. W. Bradley, A.M.I.C.E., Engineer to the City of Westminster.

Captain Kell, Lynwood, Castle Road, Weybridge.

Mr. F. H. Payne, Managing Director of the New Olympia Co., Ltd.

Mr. R. Hooper Pearson, Member of the R.H.S. Scientific Committee.

Mr. W. A. Bilney, J.P., Member of the Council of the R.H.S.

Mr. E. A. Bowles, M.A., Member of the Council of the R.H.S.

Mr. G. Bunyard, V.M.H., Member of the Council of the R.H.S.

Mr. Jas. Hudson, V.M.H., Member of the Council of the R.H.S.

Mr. W. Marshall, V.M.H., Member of the Council of the R.H.S.

Mr. H. B. May, Member of the Council of the R.H.S.

Mr. H. J. Veitch, V.M.H., Member of the Council of the R.H.S.

The Rev. W. Wilks, M.A., Secretary of the R.H.S. (Represented).

Representatives of the Daily and Gardening Press.

THE MENU.

立献	MENU.
ヴーダ ーホ	Hors d'œuvre.
ア ソアポ ダ ドラサ ンアジリパ ラ	Salade de Poisson à la Parisienne.
ユニダ トツレテーコ ルオレク	Côtelettes d'Agneau Créole.
ウオ アフ レブ アソレク	Poulets froids au Cresson.
	Jambon à la Gelée.
リエジラア ボンアジ フパ ダ グンラ	Langue de Bœuf.
ングレ ダ ズチヨマ	Mayonnaise de Légumes.
アーアヴパ ルアリペンイ	Bavarois Impériale.
ーセラグ ンアドセマ アクリ ウオ	Macédoine Glacée aux liqueurs.
ラ ア ズーレフ ムーリク	Fraises à la Crème.
琲珂	Café.

TOAST LIST.

1. THEIR IMPERIAL MAJESTIES KING GEORGE AND QUEEN MARY.

Proposed by THE PRESIDENT.

2. HIS MAJESTY THE EMPEROR OF JAPAN.

Proposed by THE PRESIDENT.

3. OUR JAPANESE GUESTS AND JAPANESE HORTICULTURE.

Proposed by THE PRESIDENT.
Response by DR. BUNJI MANO.

4. THE ROYAL HORTICULTURAL SOCIETY.

Proposed by his Excellency the Japanese Ambassador, MR. TAKAAKI KATO.
Response by SIR DANIEL MORRIS, K.C.M.G., D.Sc., D.C.L., V.M.H.

5. SIR TREVOR LAWRENCE, K.C.V.O., V.M.H.

Proposed by SIR ALBERT ROLLIT, D.C.L., Litt.D., LL.D.

祝盃順

一、英國王皇帝陛下萬歲
主唱者　會長

二、日本天皇陛下萬歲
主唱者　會長

三、日本賓客諸君及び日本園藝萬歲
主唱者　會長
答辭

四、王立園藝協會萬歲
主唱者大使加藤高明君
答辭サー、ダニエル、モリス

五、男爵サートレヴアー、ローレンス閣下萬歲
主唱者サー、アルバート、ロリット

On the conclusion of the luncheon, the toast of "Their Imperial Majesties King George and Queen Mary" was proposed by the President, Sir TREVOR LAWRENCE, Bart., K.C.V.O., V.M.H.

Proposing the toast of "The Emperor of Japan," the PRESIDENT said that we could drink this toast with the greatest satisfaction, knowing, as we do, that his Imperial Majesty is in all respects a constitutional sovereign and a warm friend of Great Britain.

The toast of "Our Japanese Guests and Japanese Horticulture" was next proposed by the PRESIDENT, who said:

Your Highness, my Lord, your Excellencies, and Gentlemen:

I need hardly say that this is the toast of the day. I offer it heartily on behalf of the Royal Horticultural Society, which gives our visitors a most cordial welcome. It is my personal good fortune and pleasure to know a large number of Japanese, and I am able to say

confidently that the more English people learn to know of them, the more they will like them. It has never been my good luck to visit Japan, but several of my intimate friends have done so, and it is very gratifying to hear them speak of the warm and hospitable welcome they invariably receive in that country. The Japanese are a people of a sunny and happy nature, possessing a spontaneous gaiety of disposition which we ourselves fully appreciate, but in our less brilliant climate cannot emulate. I am glad the relations existing between our nation and theirs are so cordial. These have now existed for many years, and the tendency is for them to grow warmer. This morning's papers contain information of great importance, namely, that of the conclusion of a new Russo-Japanese Treaty. This Treaty is likely to be pregnant with advantage for the welfare of the two countries concerned and is calculated to settle present, and obviate future, misunderstandings between them. The establishment of such relations is a cause of satisfaction to all, especially to countries like ours with all-important interests in the East. The greatest interest is Peace.

The Japanese flora has contributed some of our most valued garden plants, including the beautiful *Iris Kaempferi*, which our visitors can see is almost as well cultivated in England as in Japan. I think nothing is more entrancing in Japanese art than a view of a tea-house enveloped in its graceful covering of Wistaria, and this lovely climbing shrub adorns the walls of many a cottage in Britain. Besides the Wistaria and Iris, Japan has given us many beautiful garden plants and shrubs, such as Chrysanthemums, Lilies, Diervillas, Camellias, Azaleas, and such trees as Paulownia, Maples, Cryptomerias, and other conifers.

I have heard a few expressions of disappointment at the Japanese gardens of the Exhibition. May I remind you that these gardens are new ones, only just planted? Anyone with the smallest knowledge of garden-making knows the impossibility of producing a matured garden in so short a period as two to three months. The planning and laying out are excellent, and sufficient to indicate what the gardens would become in a year or two's time.

There is one other matter I should like to refer to—that is, the admirable choice Japan makes of her representatives in Great Britain. I have had the good fortune to know the present Ambassador for many years, and to know him is to have a warm regard for him and a genuine admiration for his distinction as a diplomatist. If the occasion were suitable I might expatiate on the charm of Madame Kato and her daughter. As Ambassadors, Japan has sent us of her best. No fewer than three of her representatives here have been successively Foreign Ministers in Japan.

Your Highness, my Lord, and gentlemen, I ask you to join with me in drinking the toast of "Our Japanese Guests and Japanese Horticulture."

Dr. Bunji Mano, responding, said:

It gives me very great pleasure to say on behalf of the country of Japan how grateful we are for the kindness shown to us by your Society.

It is not easy to express my sentiments in a foreign tongue. Your proverb occurs to my mind, "Silence speaks louder than words." We in Japan have a similar proverb.

You have invited us to your show of flowers and to have the privilege of meeting you here. Our appreciation of your cordial hospitality is very great, and I appeal to your kind hearts to understand what, though my words are few, you know I wish to say in response to the toast.

With regard to the Japan-British Exhibition, to which your President has referred, I think we are able to show something in our gardens there of a nature specially illustrative of our country. The several gardens are not purely Japanese. They manifest the good feeling existing between the horticulturists of England and Japan; equally they symbolize the alliance between our countries, for Japan supplied the ideas and the plants while Great Britain contributed the site and materials. And so "The Garden of Peace" is the name aptly given to one of the gardens, meaning the peace in our relation to one another.

I thank you again for the manner in which this toast has been received, and wish your Society every prosperity and success in future years.

His Excellency the Japanese Ambassador, Mr. Takaaki Kato, rose to propose the toast of "The Royal Horticultural Society." He said:

I add my appreciation of the kindness shown by the President and Council of the Royal Horticultural Society in arranging this visit to their Summer Show. We have been given no little pleasure. I have further to express the gratitude of my countrymen for the interest this Society has shown in them. To-day's hospitality, and the cups awarded to the exhibits at the Japan-British Exhibition, testify to such interest.

The Royal Horticultural Society has had an honourable career now extending over a century. During these long years it has known many vicissitudes. The records of thirty years ago show an impoverished state of affairs, and it would have appeared that the Society must then come to an end. Thus in 1887 a debt existed of £1,150; there was an annual outgoing of £3,600, with an income of less than £3,000 from only 1,100 Fellows. Such was the condition of the Society then; but when Sir Trevor Lawrence, the President, with other gentlemen, set to work to resuscitate this fast-failing Society, there was a spontaneous change for the better. The result is that the excellent work then undertaken and since maintained by the Society has raised it to one of the leading scientific institutions of the world. To-day it has 12,000 Fellows; an annual income of £24,000; a magnificent exhibition hall and offices costing nearly £50,000; a famous garden of sixty acres; and a handsome reserve fund.

There is no work in this world more estimable than that directed by this Society. Gardening ennobles character and makes men forget the worries of life. Art and artistic productions by human hands have virtues which require application, time, and money to attain them.

but in the care of trees, plants, and flowers there is something which supersedes other arts. They appeal to men of intellect and refinement, and, I am deeply pleased to add, they appeal to most men. The Royal Horticultural Society is doing a very useful service in extending the love of flowers and in encouraging the growth of fruits and vegetables. It is to be sincerely desired that this Society will always enjoy its present success and prosperity to enable it to continue its influence in English gardens. In expressing this wish I should err if I did not say that the present success is greatly due to many eminent men present here to-day. In the first place of honour stands the President, who I am privileged and proud to regard as one of my personal friends. It is not courtesy to praise a man in his presence—therefore I refrain from saying more, but satisfy myself in wishing him good health and a still long and prosperous life.

I am allowed to associate Sir Daniel Morris with this toast. He has done very great service to his country both at home and abroad—in the Royal Gardens at Kew, in India, and in the West Indies. I am told that the present prosperity of the Society is partly due to his efforts while Treasurer. With these few words I ask you to join me in drinking the toast of "The Royal Horticultural Society."

Sir Daniel Morris, K.C.M.G., D.Sc., V.M.H., said:

I regard it as a great honour to respond to the toast of "The Royal Horticultural Society" on this interesting occasion. I desire, in the first place, to congratulate his Excellency the Japanese Ambassador on the eloquent terms in which he has proposed the toast and the intimate knowledge he has shown of the history and progress of the Society. He has most ably summarized the successive steps by which the Society has attained its present position, and he has delighted everyone by the facility and clearness with which he has expressed himself in a language not his own. The Royal Horticultural Society has attained its present prosperity and its extensive field of usefulness by the happy and long-continued co-operation of all interested in horticulture, including those who are more intimately concerned with the practical side. Whether the Society has been instrumental in creating the greatly extended interest taken in gardening in recent years I would not like to say, but there can be no doubt that it has fully appreciated its position as a national organization, and it has not been unsuccessful in meeting the demand made upon it.

When, at the end of the year 1887, the task was taken in hand of reorganizing the Society and endeavouring to give it a fresh start, it was determined to build up a purely horticultural institution, and secure the hearty support of the leaders in the several sciences associated with plant-life, as well as of all lovers of gardens and those in practical charge of them. The results, as we now see them, have been signally successful. We have to-day a well-equipped Society with 12,000 Fellows, and a yearly income amounting to £24,000. In Sir Trevor Lawrence, as President, we have a distinguished horticulturist, who

for more than a quarter of a century has successfully directed the affairs of the Society, and sedulously watched over its interests. Standing second only to the President, we have our valued and esteemed friend, the Rev. W. Wilks, who since 1888 has so loyally and ably discharged the duties of Secretary. We regret his absence to-day, but we hope to see him soon among us in his accustomed health. When the history of the Society comes to be written, no name will stand more prominently, or be remembered more warmly, than that of our Secretary. Our function to-day is a singularly pleasant one. We are proud to extend the hospitality of the Royal Horticultural Society to our Japanese visitors, and to bid them a hearty welcome to our great Summer Exhibition. There is hardly any country which appeals more strongly to the sympathy of horticulturists than Japan, which for ages past has been the home of beautiful gardens and flowers, and of examples of a horticultural art specially its own. Although a Japanese friend on my right has assured me that the flowers and plants of Japan are in some instances better grown in this country than in their original home, we can only accept this as a compliment, but we appreciate it nevertheless. On one point, however, my friend declares he is quite certain, that, although in spring the cherry blossoms of Japan may be unsurpassed elsewhere, he has never tasted finer fruit than the English cherries placed on our table to-day. In addition to our Japanese friends, we have several notable guests whom we are happy to see among us. These include the Secretary of the Board of Agriculture, the Director of the Royal Gardens at Kew, the head of the Botanical Department at the British Museum, the Director of the Innes Research Station, and others who are in full sympathy with our efforts and afford us valuable assistance from time to time in solving the many problems submitted to those who are members of the Scientific Committee. I may add that, as chairman of that committee, we still have our most distinguished living botanist, Sir Joseph Hooker, who recently celebrated his ninety-third birthday. The Society also receives most valuable assistance from the specialists who serve on the Fruit and Vegetable, the Floral, the Orchid, and the Narcissus and Tulip Committees. Probably no horticultural Society anywhere possesses a more representative brigade of experts capable of dealing with the various technical matters submitted to them at the various shows throughout the year.

I have ventured so far to supplement the remarks of his Excellency in reviewing the work of the Royal Horticultural Society, and endeavoured to indicate the machinery by means of which it has reached its present prosperity.

I have to thank his Excellency for his kindness in proposing the toast of "The Royal Horticultural Society," and I assure him and our guests, his countrymen, that it is a source of great pleasure to us to see them here to-day, and to show them how deeply we value their friendship, and with what warm appreciation we regard them and their

country in the entrancing delights of horticulture which we all so widely share.

Lieut.-Colonel Sir ALBERT ROLLIT, LL.D., proposed "The President." He said:

His Excellency the Japanese Ambassador has helped me by his allusions to the President, and, indeed, the toast requires no advocacy, and might well be submitted as a toast without words. I heartily appreciate the very kind expressions of his Excellency towards the Royal Horticultural Society and its President, and, reciprocally, I wish every success for the Japan-British Exhibition. It is most splendid in its display of the artistic products of Japan, and owes much to the exertions and interest of his Excellency, as also of Count Mutsui, whose absence we all deeply regret and to whose return in good health and strength we look forward most hopefully. Baron Oura, too, we most cordially welcome as a Minister of Japan and the President of the Japanese Section of the Exhibition. The presentation of Japanese art is resplendent, and gives a blow to a report of a Japanese commission, which was said to have declared that art is asleep in Japan and dead in Europe. The Exhibition shows that the highest art is very much alive, and in this it is typical of the British-Japan Alliance, which sealed the comity of the two island peoples of East and West, and contributed to the peace and progress of the old world. May the Alliance flourish for ever, to speak horticulturally, root and branches. We owe much in the art of landscape gardening and in culture to Old Japan. Some seem to suppose that Japanese culture had suddenly sprung into life in the last quarter of a century. But Japan flourished under the same dynasty as to-day when Ancient Greece was in the plenitude of her power; when Romulus and Remus were jumping over the rising walls of Rome; and when we were very Ancient Britons bedaubed with many colours both on our bodies and our characters—indeed, Japan is as ancient as Nebuchadnezzar and as the Garden of Eden, and perhaps more so. In gardens and gardening she has given us artistic ideas and exquisite plants, examples of which may be seen in the Japanese Exhibition, in the Holland House Grounds (for the use of which we are all so indebted to Lady Ilchester), at Gunnersbury and elsewhere.

The Royal Horticultural Society has had varying fortunes, but now, by exhibitions, teaching, and research, it is most prosperous, and this is, in a very great measure, due to organization by the President. His labours have contributed profoundly to the present love of gardening, and I ask you to drink his health, and sound the alliance between the two Empires by joining British cheers with Japanese banzais. (Banzais and cheers.)

The PRESIDENT, acknowledging the toast, said: I am much obliged for the very kind way Sir Albert Rollit has proposed my health. You know Sir Albert makes admirable speeches, but he has one defect—

namely, that of exaggeration. What I should like you to remember is that what has been the foundation of the prosperity of the Royal Horticultural Society is the wonderful expansion of the love of flowers and gardens in this country. May it never be less!

I should like to add that one great advantage I have derived from being President of the Society is the pleasure of seeing so many Japanese friends here to-day. If there is anything I can do for any one of the visitors it will afford me the greatest satisfaction; I only wish we had had better weather for your visit.

PATRONS OF THE SOCIETY.

The sudden passing of our late King, Patron of our Society, and the subsequent impressive State events will not have faded from the minds of the Fellows when this notice appears in the Journal. Ever since the far-back date of the unfortunate Queen Caroline the Society has been able to count the successive reigning Sovereigns as its Patrons—King George IV., King William IV., Queen Victoria, and lastly King Edward VII. Death has removed each one in turn, but their influence and the memory of their support still remain as the heritage of our Society. We rejoice in having Queen Alexandra as a Patron still.

At a special meeting of the Council on May 10 it was resolved to send an Address of Condolence to His Most Excellent Majesty King George V. and a wreath to His late Majesty's funeral. The Address was as follows:—

To His Most Excellent Majesty
The King and Emperor George V.

May it please your Majesty,—

We, your Majesty's loyal, attached, and dutiful servants, the Council of the Royal Horticultural Society, humbly approach your Majesty on behalf of ourselves and Fellows with the expression of our deep sorrow at the grievous loss which has overtaken your Majesty in the death of our beloved King and Emperor His Majesty King Edward the Seventh, Patron of our Society.

His Majesty, both before and since his accession to the Throne, has ever shown a very friendly feeling towards the Society, and we cannot forget that he graciously contributed to the building of our new Hall. We feel, as do all his subjects, that his death has been an irreparable loss to everyone throughout the Empire.

Signed on behalf of the Council and Fellows:

Trevor Lawrence, *President.*

The wreath was designed and supplied by Messrs. James Veitch.

New Patrons.

It was felt desirable that their Imperial Majesties King George and Queen Mary should be asked with all convenient speed to become Patrons, and the following Petition praying for this grace was drawn up and presented:—

May it please your Most Excellent Majesty.

Sire,—We, your Majesty's loyal, dutiful, and attached servants, the President, Council, and Fellows of the Royal Horticultural Society,

ask permission to approach your Majesty with a humble petition that you would be graciously pleased to honour us by becoming Patron of our Society. Your Majesty's deeply lamented father had been Patron of the Society since the death of Her Gracious Majesty Queen Victoria, of revered memory. His Majesty had ever shown a warm interest in the Society, subscribing to the building of our magnificent Horticultural Hall, which he was graciously pleased to "open." Your Majesty also we have had the honour to number among the subscribers to our Hall.

The Society embraces a vast number of the more prominent and active of the great garden-loving public among your Majesty's servants, and nothing would be more grateful to them, we are confident, than that the reigning Sovereign should again be graciously pleased to become its Patron.

Earnestly praying that Providence may grant you a long, happy, and prosperous reign,

We are your Majesty's loyal, dutiful, and attached servants,

TREVOR LAWRENCE,
For the Council and Fellows of the Royal Horticultural Society.

A similar Petition, with the exception of the necessary verbal alterations, was addressed to Her Majesty the Queen.

It was with no little pleasure and satisfaction that the following communications were received by the President and Council:—

Marlborough House, Pall Mall, S.W. : June 20th, 1910.

DEAR SIR,—I am commanded by the King to inform you that His Majesty is graciously pleased to become Patron of the Royal Horticultural Society.

Yours faithfully,
W. CARINGTON,
Keeper of His Majesty's Privy Purse.

The Secretary, Royal Horticultural Society.

Marlborough House, Pall Mall, S.W. : June 23rd, 1910.

DEAR SIR,—I am commanded by the Queen to inform you that Her Majesty is graciously pleased to become Patron of the Royal Horticultural Society.

Yours faithfully,
E. W. WALLINGTON,
Private Secretary.

The Rev. W. Wilks, M.A.,
Secretary R.H.S.

BOOK REVIEWS.

"Diseases of Cultivated Plants and Trees." By George Massee, F.L.S., V.M.H., 8vo., xiv. + 602 pp. (Duckworth, London, 1910.) 7*s.* 6*d.* net.

More than ever before, the cultivator of plants of whatever kind seeks to know the reasons of failure. He has learned that many of the troubles to which his plants are heir are due to attacks upon them of fungi or animals; and, though he is too prone, perhaps, to think that all troubles must be laid at the door of these pests, yet the recognition of the fact that disease is the effect of some definite cause or causes is a great gain. Often the way is opened for disease-producing organisms by bad (or probably it would be better to say improper) cultivation, arising from a lack of understanding of the physiology of plants. The race for size and the desire to force plants beyond their capabilities both assist in weakening their constitutions, with the result that numerous diseases assail them to a markedly injurious extent.

Many books have appeared dealing with diseases of plants brought about by fungus or insect attacks, but the frequent additions to our knowledge of the causes of disease soon render such books out of date, and frequent revisions or entirely new works are required in order to be abreast of the times.

The author in 1899 published his "Text-book of Plant Diseases," and has wisely, now that it is out of print, rewritten the work entirely upon a rather different plan and with the addition of much of the work that has been done since his former volume was published. There are two convenient ways of arranging a book on diseases due to parasites. One is to arrange it according to the nature of the plants attacked—the method adopted by Dr. Cooke in "Fungoid Diseases of Cultivated Plants," published by our Society; the other to arrange it according to the nature of the organism causing the attack. The author has adopted the latter method. It is one that certainly prevents a great deal of repetition, and the disadvantages attaching to it are entirely nullified when a good index is provided.

The author has given a brief but good review of most of the common physiological diseases and of some of those due to animal parasites, as well as those due to the attacks of fungi and bacteria, the last occupying by far the greater portion of the book and constituting the part which the author has made peculiarly his own. Almost all the diseases due to these parasites claim attention in turn, and a few are included that are only of academic interest. Excellent accounts are given of such well-known and troublesome diseases as "Black scab" or warty

disease, as it is better to call it, in potatos; "damping off"; scab in apples and pears; the mildews of various crops; rusts and smuts, and so on. In the case of the first named the author changes the name of the fungus from *Chrysophlyctis endobioticum* to *Synchytrium solani*, but we think this name is antedated by Percival's *Synchytrium endobioticum*, by which name the fungus should now be known, for it appears to be an undoubted *Synchytrium*. Unfortunately, no cure or preventive measure when once the soil is infected has so far been discovered.

Recipes for the making of the most approved fungicides are given, and the various curative, and especially the preventive, measures that may with reasonable hope of success be adopted are referred to after each of the hundreds of diseases described. The symptoms of the diseases are usually carefully detailed, and the text is admirably aided by the 171 excellent illustrations which adorn the clearly printed book.

Altogether the work is one that we have every confidence in recommending to the cultivator as a trustworthy source of information on many of the diseases he so frequently meets.

There are a few things, however, to which we venture to draw the author's attention, since they detract somewhat from the value of the book and may be easily rectified in a future edition when the present one is exhausted, which we are sure will be before long.

The book is one manifestly intended for the cultivator who may be entirely ignorant of the names of fungi. We therefore think that to call a fungus on two pages (335, 356) *Armillaria mellea*, and then to apply the name *Agaricus melleus* to it on the next, is, to say the least, misleading, especially as there is no indication in the text that the two names are synonymous.

We may pass over the rather numerous typographical slips and test the index. The value of a book arranged like this depends very largely for its usefulness in the hands of the cultivator upon the accuracy and comprehensiveness of the index. We have tested it in several places and often found it wanting. We can find no reference to the well-known disease of cruciferous plants called "club-root" in the index except under the name *Plasmodiophora brassicae*, which few cultivators are likely to know at all and fewer to remember for long, yet a full and excellent account appears on pp. 524-27. In many cases some references are given to a plant under its common name, and others under its botanical name; *Pyrus* is spelt correctly in one part of the index, and *Pirus* in another. Under *Ribes nigrum* we are referred to p. 300, but there is no mention of the plant there; probably p. 320 is meant. We cannot find *Picea silkaensis* (index, p. 599), nor *P. sitkaensis* (p. 254), to which we are referred, in *Index Kewensis*. Possibly *P. sitkaensis*, better known as *P. sitchensis*, is meant.

These minor points detract considerably from the usefulness of the book, though they in no way interfere with its general excellence, and we hope that, for the sake of its many readers, a new and fuller index will be made for the next edition.

"The Enemies of the Rose, 1910 Edition." By G. Massee, V.M.H., and F. V. Theobald, M.A. 8vo., 97 pp. (E. Mawley, Berkhamsted, 1910.) 2*s*. 6*d*.

This useful little book, by two acknowledged masters in their respective departments, will be read eagerly by the rose-grower, for no one is more keen in the fight with pests than he. Here he will find almost all he can want to know, and an excellent "Pest Calendar" telling him what to look for in each month of the year, compiled by Mr. H. R. Darlington.

"The Alphabet of Gardening." By T. W. Sanders. Ed. 4, 8vo., 198 pp. (Collingridge, London, 1909.) 1*s*. 6*d*. net.

It speaks well for this useful book that a fourth edition has been issued. Having already reviewed previous editions, we need only add that the reader cannot fail to get a clear grasp of all the subjects, the text and diagrams being all so well done and so thoroughly practical.

"The Rose Annual for 1910." Edited by E. Mawley. 8vo., 174 pp. (E. Mawley, Berkhamsted, 1910.) 2*s*. 6*d*.

Every rose grower ought to have this interesting and valuable book. This issue is not larger than the previous ones, but contains articles of really permanent value. The list of twenty-four roses for general cultivation by H. R. Darlington, an excellent chapter on the Hybridization of Roses by Walter Easlea, plans of rose-gardens by C. E. Shea, R. C. Mount, Dr. A. H. Williams, and Miss Dorothy Page-Roberts, are full of interest, as is the article on the Treating and Training of Weeping Standards by Alfred Tate, and are only a few of the subjects that will be eagerly perused by readers. The National Rose Society is deserving of all praise for publishing such a mass of information of the greatest value to all rose growers, in whatever part of the kingdom they may be living. The illustrations are very good, and the index at the commencement of the book is admirable.

"1500 Gardening Questions Answered." 8vo., 230 pp. (The Cable Printing and Publishing Company, London, 1910.) 1*s*.

This book is a carefully compiled mass of questions and answers properly classified and indexed. Perplexed readers of "Garden Life" have written to the editor for information on horticultural matters, and these questions have all been answered in a concise and practical manner, altogether making a very interesting book full of sound, brief information.

"The Landscape Beautiful." By Frank A. Waugh. 8vo., 336 pp. (Orange Judd Co., New York, and Kegan Paul, London, 1910.) 10*s*. net.

We fear this book is too costly for a ready sale in this country; half the price would be more appropriate, for although it is beautifully

printed, and adorned with lovely illustrations of the photographic type, there is not much in it that will appeal to the garden lovers on this side of the Atlantic. We quite agree with the author that natural effects are much the best, and carried out on a big scale the effect is all one could desire, but in Britain it is only in comparatively few places where these ideas can be carried out. The author writes in a most charming poetic and artistic style, making his book very pleasant reading, quoting the works of many well-known British and American landscape gardeners, giving instances of American masterpieces, including the principal public parks, town and roadside planting, etc.

"The Outlook to Nature." By L. H. Bailey. 8vo., 290 pp. (Macmillan, New York, 1905.) 5*s*. net.

This interesting book contains four lectures on "The Realm of the Commonplace," "The Country and City," "The School of the Future," and "Evolution—the Quest of Truth."

The object of the first well shows how much is lost to the city man or other person whose mind has never been directed to read Nature's lessons, much less profit by them. To a thorough student, like the author, *nothing* is unworthy of observation, from a mouse to a sunrise. People write poetry about Nature, but Professor Bailey's estimate is that such is *not* Nature poetry, but largely silly and bookish.

The contrast of the want of an appreciation of "naturalness" on the city mind was well shown in a street scene he witnessed. A crowd was, as usual, going along. Suddenly a little dog rushed from an open door. Two children scampered after it, caught it, laughingly, and carried it lovingly in. The men stopped, gazed, then cheered! It was "only an episode of genuine, spontaneous, and unaffected human nature," but it suddenly woke up a feeling for *naturalness* in all of them.

The contrast between the city mind and the country is continued in the second lecture. As to the school of the future, Professor Bailey takes the following as his text: A child was asked what an educated man was. She replied: "He is one that does not work." "This is a popular conception, that education does not put one into direct relation with the affairs of life. It was an old idea that education makes a man accomplished. It is the new idea that it also makes him useful."

The last lecture, on "The Quest of Truth," is an admirable and concise epitome of the grounds on which evolution is based, which ought to satisfy the few still remaining disbelievers in this doctrine. The author gives a summary of the chief studies which supply innumerable facts—"Palæontology, embryology, comparative anatomy, physiology, genealogy, successive increase of differentiation [we might add degradation], the great fact of adaptation, distribution with variations, variation with intergradient forms, domestication" (and experimental verification). Concluding, the author says: "It seems to me that we are to pass the Age of Doubt. . . . The verities of religion lie deeper

than dogmas. . . . Freedom and simplicity are requisite to great religious growth. . . . We are coming to a religion of joy and activity, full of high spirituality, of great trust in Nature, of hope in man, and of direct dependence on the Almighty." The thoughts are liberal, true, and intensely instructive.

"Insect Stories." By Vernon L. Kellogg. 8vo., vii. + 298 pp. (Bell, London, 1908.) 5*s*.

Of the many popular tales of insects we have come across this is among the best, both in its choice of subjects and the kindly manner in which they are put before the reader. The author and his young acquaintance "Mary" go out and see things together. They watch the actions of insects going about their everyday occupations and living their interesting lives by the hour together, and they discuss what they have seen and what others have seen in language such that any child of average intelligence can understand and follow the lucid tales the author tells. There are tales of the sand wasps—"the narrow-waisted mother"—ants, May-flies, bees, ant-lions, and so on, and they go to make a book we should like to see in the hands of every budding naturalist.

"Economic Zoology." By H. Osborn, M.Sc. 8vo., xv. + 490 pp. (Macmillan, New York, 1908.) 8*s*. 6*d*. net.

This book is intended to serve as an introductory text-book of zoology, and the types chosen for study are, for the most part, such as have some connexion with human affairs. There appears to be little, however, of what is usually regarded as "economic" zoology, and it is probable that it would be better in a zoological course to study the principal types irrespective of whether they are of economic importance or not. Very little is said as to methods of control of injurious pests, and the life histories given of useful and harmful animals are, for the most part, too brief to be of any great practical value. We think the author might easily improve his diction in many parts of the book, but apart from this he has produced what appears to be a trustworthy introduction to the science of zoology.

"A Text-book of Entomology." By Alpheus S. Packard, M.D., Ph.D. 8vo., pp. xvii. + 729. (Macmillan, London, 1903.) 18*s*. net.

This text-book deals with an aspect of entomology which comparatively few take up, the morphology and anatomy of insects. It is perhaps the most comprehensive work that has appeared on the subject on which it deals, and serious students of entomology will find it a perfect mine of information, laboriously collected and carefully arranged. The book is well illustrated and, of course, clearly printed, as all the books published by this firm are. The author is to be congratulated on the excellence of the index which he has provided.

"Manual of Gardening." By L. H. Bailey. 8vo., 539 pp. (Macmillan, New York, 1910.) 8*s*. 6*d*. net.

This is a comprehensive work on the art of garden-making, under which title the author discusses all that can be said with reference to the formation, position, planting, flora, and general management of the American garden. There is nothing strikingly new in the book, but each section is exhaustively treated and presented in that terse and crisp manner that differentiates Professor Bailey's work from the ordinary text-book on horticulture.

A work written primarily for American readers necessarily contains much that has little interest or reference for English readers. There are, however, underlying the whole, certain broad principles that to a great extent dwarf the purely local colour and render the work useful to the English gardener.

A delightfully written introductory chapter gives the key to the author's view of gardening and garden-making—a chapter he very appropriately finishes off by observing that "the joy of garden-making lies in the mental attitude and sentiments."

Professor Bailey has written much that is interesting and useful on the question of trees. Proper methods of planting and after-management are treated in a very practical spirit, especially so is the section devoted to tree surgery. Injuries to trees from accident, animals, and disease, and the most up-to-date methods of dealing with them, are fully illustrated and explained.

Climbing plants and their use, too, are given considerable attention. Here, as elsewhere in the book, the list of plants is rather inflated. A selection of the best kinds would be preferable to a collection. With the many beautiful American climbing plants one would certainly hesitate to include such poor things as *Solanum Dulcamara* and *Adlumia cirrhosa*.

The reader will find this a useful book of reference and one that should have a place in every garden library.

"How to Know the Trees." By Henry Irving. 8vo., 179 pp. (Cassell, London, 1910.) 3*s*. 6*d*. net.

Whether for simplicity of language, accuracy of description, or the beautifully executed illustrations, this work on our commonly cultivated trees probably stands ahead of any other that it has been our pleasure to review. Just what is required for the student of our trees, and sufficient in every instance to readily recognize the species, is included in this daintily got up pocket volume. Simplicity of detail would seem to have been the author's idea in writing the description of each tree, and in this he has certainly succeeded admirably; while the many illustrations will appeal to the beginner, who has to rely on these, in conjunction with the text, in identifying any particular species. The tabulated descriptions of the often-confused beech and hornbeam are clearly given at page 30, and on the opposite side the chief and marked

peculiarities of the leaves of the hornbeam and bark of the Sweet or Spanish Chestnut could not have been more distinct or truthful in delineation.

"Ancient Plants." By Marie C. Stopes, D.Sc., Ph.D. 8vo., 198 pp. (Blackie, London, 1910.) 4*s*. 6*d*. net.

Fossil plants receive much less attention than fossil animals from those who take only a general interest in the past history of our planet. A gigantic saurian or huge ammonite naturally arrests attention. It is obviously "something new and strange" to the observer. It is otherwise with fossil plants. It requires definite botanical knowledge to see the significance of a Lycopod as tall as an oak. Moreover, the main results of the study of fossil plants are achieved by the aid of microscopic investigation of thin sections of "petrified" material. All this is beyond the reach of the general reading public. But of late years indifference has given place to interest. Most students of botany and geology now realize the immense importance of fossil botany, while many who are not seriously working at these subjects are sufficiently interested in the story of the earth's past to desire to know all that can be taught in a clear, well-written account of the subject, which shall be accurate but not too technical. Such an account is given in the volume before us. Dr. Stopes thinks, and we agree with her, that her book will also be useful to university students who may wish to take a general survey of the whole field of fossil botany before proceeding to Scott's "Studies" or Seward's "Fossil Plants," to name two out of many excellent works for advanced students. Miss Stopes writes in an attractive style, while the work is well illustrated by diagrams and photographs. An account is first given of the various ways in which plants become fossils. Coal and "coal-balls" (the greatest of all treasures to a fossil botanist) next receive attention. After chapters on the "seven (geological) ages of plants," and on the "stages of plant evolution," the writer proceeds to deal with the minute structure of fossil plants, on which so much depends. The book then proceeds to give "Past Histories of Plant Families," beginning with the highest flowering plants, and working back through Gymnosperms (including Cordaitales and *Ginkgo*), Cycads, and Pteridosperms to Ferns. Miss Stopes carefully points out that while *Bennettites* certainly possessed hermaphrodite "flowers," yet it is quite unlikely that such a "flower" ever gave rise to the flower of the Angiosperms. *Bennettites* is highly specialized in its own way, but lies off the main line of descent. Taking then a different group, the book describes the past history of Lycopods, Horsetails, and of the Sphenophyllales. The lower plants receive some attention, and a chapter is devoted to "Fossil Plants as Records of Ancient Countries." Useful hints are given to amateur collectors. The work is very carefully written, and the student who uses it as an introduction to the study of ancient plants will have nothing to unlearn at a later stage.

"The Plant Cell: its Modifications and Vital Processes." A manual for students. By H. A. Haig, M.B., B.S. 8vo., ix. + 207 pp. (Griffin, London, 1910.) 6*s.* net.

This is a text-book dealing in a thorough but not very attractive way with Plant Histology, including Cytology. Recent cytological researches, especially those connected with the processes of cell-division, which result in the formation of sexual cells, have given this branch of botany great importance. The author seems to have aimed at producing a text-book in which the usual chapters on cells and tissues given in any fairly advanced text-book of botany should be supplemented by chapters dealing, more fully than is usual in most text-books, with such subjects as the details of cell-division, the meiotic phase, and the comparative study of the reproductive cells in various plant "types." As a book for revision purposes for a student preparing for university examinations it will be very useful. It should, however, be accompanied by a course of practical work in Plant Histology, including practical microtome work. We do not think that the study of cells and tissues, of meristems, of pits and thickenings, and of the development of the histological structure of a plant, studied in the order taken in this and other books, is useful or attractive to young students. The cell should rather be presented to the elementary student at a miniature chemical and physical laboratory. The study of the structure of a cell should accompany the practical study of the physics of the cell. The student should perform experiments on osmosis and turgidity both with the individual cells (under the microscope) and with tissues in bulk. He should look upon Physiology and Histology as parts of one subject—the study of the living plant. In the same way the study of absorption and transportation of solutions should lead to the study of vascular tissues, and experimental work in respiration and transpiration should go hand in hand with the histological study of epidermal structures and with field work in ecology. Cytology proper and the study of development should come later, and then this book would form a good summary and text-book. A few pages at the end are devoted to "Chemical and Physiological Studies in Connexion with the Cell." We have already indicated that, in our opinion, such subjects are of fundamental importance. The results of recent work on micro-chemical reactions within the cell might be given. The book is profusely illustrated with diagrams and with micro-photographs, which, with the aid of the diagrammatic sketches given, should prove very useful. The tables drawn up to show the relationship between homologous structures in Algae, Bryophyta, Phanerogams, &c. (*e.g.* the table opposite page 154), are very useful, but a student who has studied the types should make his own tables. If he has not studied the types, the tables are meaningless to him.

"The Book of the Rose." By the Rev. A. Foster-Melliar. Fourth Edition. Edited by the Rev. F. Page-Roberts and H. E. Molyneux. 8vo., 356 pp. (Macmillan, London, 1910.) 5*s.* net.

Although "The Book of the Rose" made its appearance sixteen years ago, it still remains one of the best and most practical books that

treat of rose-cultivation. It was written with much care and thought by an enthusiastic amateur who had had a life-long experience in almost every branch of rose-growing. Even his standard briar stocks were obtained from the hedges by his own hands. Indeed, the eight pages he devotes to instructing his readers how this apparently simple operation should be performed may be taken as typical of the whole work; for it clearly shows his practical knowledge of the subject and also the thoroughness of his teaching, no necessary detail being omitted. At the same time it is most delightful reading, being interspersed with humorous incidents, admirably told, connected with the topic under discussion.

Mr. Foster-Melliar had one unfortunate idiosyncrasy. He could see little beauty or use in any rose whose flowers did not approach the exhibitor's standard of large size and deep and regularly arranged petals. It is quite true, as the editors of the present edition point out, that in his day there were comparatively few varieties of that now numerous class known as "garden" or decorative roses. But there must have been something more than this. His description of that grand old rose, 'Gloire de Dijon,' will perhaps best illustrate his own point of view. After endowing that variety with almost every good quality a climbing rose should possess, he goes on to say that "a plant of 'Gloire de Dijon' may be a hundred times the size of 'Comtesse de Nadaillac,' and may have more than a hundred times the number of flowers; but take the finest 'Gloire de Dijon' that ever was seen and set it in an exhibition stand by a fair representative flower of the other and the great inferiority in every respect, even in size, would at once be manifest." In the description of this rose one can at once see the bias of this fine rosarian in favour of the "autocrats of roses," as he styles the exhibition roses, and yet at the same time his great fairness in stating everything that could possibly be said in its favour.

The editors of the present edition have carried out their revisions with great judgment. For, while retaining untouched the whole of the original work where it was not absolutely necessary to bring the information it contained up to date, they have supplied the required particulars about decorative roses, and have also included the best of those roses in a chapter of nearly one hundred pages devoted to the "Manners and Customs" of the choicest "garden" and exhibition roses now in cultivation, bringing abreast of the times one of the most original and attractive features of the book.

In the frontispiece will be found an excellent portrait of the author, and in the opening pages a most interesting account of his life and character. The numerous illustrations scattered through its pages complete a work which may be regarded as a storehouse of useful information about roses and their cultivation from the facile pen of the best writer on roses of his day.

"Roses and Rose Culture." By William Paul. Eleventh Edition, revised. 8vo., 122 pp. (Simpkin, Marshall, London, 1910.) 1s.

This is a cheap and handy little rose book, and contains a good deal of useful information; but in the next edition it would be well to bring

some of the instructions in it a little more up to date and to omit the frequent references to varieties which are seldom, if ever, grown at the present day, although, no doubt, these references may have been well understood when the first edition of this handbook was issued.

"Sweet Peas." By Horace J. Wright. 8vo., 116 pp. and 8 coloured plates. (T. C. and E. C. Jack, London and Edinburgh.) 1*s.* 6*d.*

This book is well done—well printed, well illustrated, and well written. The coloured plates are the best sweet-pea illustrations we have seen. The practical directions dealing with the preparation of the soil are excellent, and, if carefully followed, will result in good flowers. All classes of soils are treated of—heavy, chalky, and sandy. The writer wisely makes a strong point of consolidating light soils.

The selection of varieties given is up to date, and if traders could be induced to limit their lists to the varieties named by Mr. Wright what a help it would be to those who are not "in the know"! The book concludes with a long chapter on "The Cultivation of Sweet Peas for Exhibition" from the pen of the champion grower, Mr. Thomas Stevenson.

"The Book of Nature Study." Edited by J. Bretland Farmer, M.A., D.Sc., F.R.S. Vol. VI. 8vo., 244 pp. (Caxton Publishing Co., London, 1910.) 7*s.* 6*d.* net.

This book consists of two sections:

1. Meteorology, by Miss Newbigin, D.Sc.
2. Geology, by W. W. Watts, D.Sc.

The first section opens with admirable first observations on the weather. This logically leads to weather and climate, precipitation and its relation to vegetation and the measurement of rainfall. Snow and ice are next dealt with, and in this connexion we note that the illustrations are up to date.

We were greatly interested in the experiments, which are freely suggested, and, what is of greater value, approximately correct in their results. We refer to the imitation iceberg, the apparent movements of the sun, finding the true north and south line, shadow experiments to give some idea of the earth's revolution.

The second part, by Prof. Watts, opens with a chapter on denudation, followed by one on deposition. Among the most interesting and valuable chapters are those on models and maps, contour maps and geological maps, history of landscape, and growth of Britain.

The illustrations and diagrams are very fine indeed, particularly those of fossils. A very full, complete, and accurate index to the six volumes concludes this one.

This volume is the finest introduction to the study of geography, in its scientific aspect, that we have ever seen. To gardeners, and particularly beginners, we can strongly recommend it as an introduction to a more detailed study of soils and meteorology. It is a fitting topstone

to the best series of books on Nature study that it has been our lot to peruse.

"The Care of Trees in Lawn, Street, and Park." By B. E. Farrow. 8vo., 392 pp. (Holt, New York; Bell, London, 1910.) 8*s*. 6*d*. net.

It is interesting to learn that on the continent of America, especially in its cities and more settled parts, there has never before been such widespread interest as is now manifested in trees and tree-planting for shade and ornament. The present work is, therefore, of great value, especially, too, as it has been written by one who is practically acquainted with the management of trees and shrubs, both in the park and woodland. The book is divided into nine chapters, every one of which is crammed with useful information, a good deal of which is equally applicable in this country. Characteristics, pruning, care in planting and tending are all chapters of interest; but, indeed, there is little that would be of use to the lover of trees that is not included in this handy volume.

The lists of trees, too, are good, though many of the species described have not been found suitable for cultivation in this country. Insect and fungoid pests find a chapter; indeed, there is little omitted that would be of value to the cultivator of trees, whether for their æsthetic or economic value in forestry. The illustrations are well reproduced and valuable.

"Summer Flowers of the High Alps." By Somerville Hastings. 8vo., 85 pp. 38 col. plates. (Dent, London, 1910.) 7*s*. 6*d*. net.

A small book of illustrations of alpine plants reproduced from colour photographs taken directly from Nature. The illustrations in this book surpass any that have so far been published at a reasonable price, and they should be of distinct value to anyone contemplating a tour in the Alps with a view to collecting flowers. The descriptions of the habitat of the plants are good, and it is to be hoped that more of this series may appear as the number of plants illustrated is limited. Especially good among the illustrations are those of the Narcissus-flowered Anemone and the Globe flower.

"Rock Gardens. How to Make and Maintain Them." By Lewis B. Meredith. 8vo., 384 pp. (Williams & Norgate, London, 1910.) 7*s*. 6*d*. net.

For anyone contemplating building a rock garden still another book of practical value has appeared in "Rock Gardens. How to Make and Maintain Them," by Lewis B. Meredith. The author understands his subject, and all his advice is extremely good. The illustrations have been well done, and with this book in his hand any gardener should be able to construct a rock garden, and be able to grow even the more difficult of the alpine plants. The list of plants given in Part 2 will assist him to select those suitable for his particular

conditions. The chapters on cost are particularly valuable, and will prevent anyone entering too light-heartedly on the construction of a rock garden, which, at the best, is not a cheap amusement.

"Rock and Water Gardens: Their Making and Planting." By the late F. W. Meyer. Edited by E. T. Cook. 8vo., 227 pp. ("Country Life," London, 1910.) 6*s*. net.

To the practical gardener who wishes to make and plant a rock garden this work should be of great use. For the choosing of a site, the best stones to use, and, generally speaking, the plants to grow, the advice in every case is sound, to the point, and thoroughly practical. The chapters as to the making of wall and water gardens, and the combination of the latter with rock gardens, are particularly good. The lists of plants given to be planted in rock gardens, however, are in some instances likely to lead amateurs astray. Many alpines are notoriously capricious, and some of those selected would be found very difficult to grow except in the warmer parts of England. We do not envy anybody who tries to grow *Eritrichium nanum* or *Gentiana bavarica* without more information on the subject than is given here. Apart from this, the book is one that ought to be in the library of everyone who either has a rock or a water garden, or who intends to make one.

"Alpine Flowers and Gardens." Painted and described by G. Flemwell. Sm. 4to., 167 pp. (Black, London, 1910.) 7*s*. 6*d*. net.

There is little in this volume of any great use to the grower of "alpines," but it is a pleasant book for an idle hour, and the illustrations, within the limits of the three-colour process, portray accurately the position in which alpine plants naturally grow, and serve as a very pleasant reminder to anyone who has collected them in their own haunts. It is to be hoped that the book may serve to arouse sufficient interest among tourists to induce them to be more careful in their treatment of alpine flowers than they are at present. The writer in more than one excursion through the Alps has come across masses of Saxifrage and Anemones torn from their roots and thrown down anywhere because they were too heavy to carry. Monsieur Correvon writes an appreciative preface to the book from the point of view of its artistic merit, in which it certainly excels.

"Profitable Fruit-Growing for Cottagers and Small Holders of Land." By John Wright, V.M.H. 9th ed., 8vo., iv.+127 pp., with 53 illustrations. (Collingridge, London, 1910.) 1*s*.

Pages 1 to 92 of this book contain the essay which won the gold medal offered by the Worshipful Company of Fruiterers in 1889, the remainder being added in the sixth edition, with which the present one is practically identical. There is probably no better book at the price for beginners in fruit-growing, whether for pleasure or business, while amateurs of experience can scarcely fail to profit by a perusal

of it. The routine work of all sorts in connexion with the cultivation of the most commonly grown hardy fruits is described clearly, concisely, and fully, while the recommendations as to varieties—brought quite up to date by the inclusion of James Grieve and Bismarck amongst the apples—could scarcely be improved upon, members of the Fruit Committee of the R.H.S. having been consulted in connexion therewith.

If it is desired to pick out a fault in such an excellent little manual the illustrations afford an excuse, some of them—*e.g.* the strawberry edging on p. 21—being somewhat crudely diagrammatic, and possibly misleading to a novice.

"The American Flower Garden." By Neltje Blanchan. 4to., 368 pp. (Heinemann, London, 1909.) 21*s.* net.

This is a handsome volume of garden literature, well got up, and profusely illustrated with nearly a hundred half-tone engravings as well as some finely coloured half-page plates.

The illustrations are chosen with care and good judgment, and illustrate precisely what is wanted.

The authoress in some sixteen chapters deals with the American aspect of gardening in a very original manner and from every possible standpoint.

After an admirable introduction to the art of gardening as evidenced by the partnership between Nature and art and the correlation of situation and design in the garden, the reader is given a series of well-written essays on the various types of gardens and the importance of careful adaptation to the character of the environment, and also of the nature of the flora with which to enrich them.

For trees and flowering shrubs she has a keen and artistic appreciation, indicating with nice judgment exactly the value of sylvan character in the landscape and garden.

Some interesting advice is given on the subject of moving big trees, a matter of more importance, perhaps, in the immediate neighbourhood of the large American cities than in an English country district. As practised in the States the authoress says: "One enthusiastic amateur has reduced the percentage of loss to less than 5 per cent. of all the trees he moves, and so daring has he grown that he no longer root-prunes a tree before lifting it nor hesitates to transfer a horse-chestnut in full flower from one part of his estate to another."

Mrs. Blanchan's book is of course written for the American public, but there is so much that is common to both sides of the Atlantic in the matter of gardening that we can fully appreciate the instructive illustrations and the very refined, artistic, and perfectly natural advice given.

To English readers the book should prove attractive and entertaining; it is a "readable" book without the least trace of that pedantic tone one almost unconsciously expects from such an ambitious title. It is, too, a book that will be equally acceptable to the landowner and gardener alike.

A very concise but comprehensive series of planting lists is added by Mr. Leonard Barron. These lists considerably enhance the value of the book from a practical point of view, since they show a particular differentiation between mere collections of good and indifferent plants, trees, vines, and bulbs, and a careful selection of the best of these subjects for any special purpose.

"Roses of the Bavarian Highlands" ("Die Rosen des Südlichen und Mittleren Frankenjura"). Imp. 8vo., 248 pp. By Dr. Joseph Schwertschlager. (Munich, 1910.) 10 m.

This book deals with "The Roses of the Southern and Middle Frankenjura, their systematic and phylogenetic arrangement, with a review of the whole race of Roses and the general problem of their descent." Known to the botanist as "Rosa," to the gardener as "rose species," and to the mere man as "wild roses," this department of the kingdom of flowers has probably received more attention from monograph writers than any other, and the book entitled as above is the latest contribution to the subject.

The Frankenjura form a range of hills lying in crescent shape round Nuremberg, running from the north by the east, and reaching to the southward of the town down to the valley of the Danube. The district selected by the author for his investigations is roughly the portion of these hills between Nuremberg and the Danube where it extends from Donauworth on the west to Regensberg on the east, with Eichstadt as its centre, and forms an area of about seventy miles from east to west and half that distance from north to south. Some of the hills rise to over 2000 feet, and the district appears to be particularly rich in varieties of wild roses, and especially of hillside roses. The book before us is, however, a good deal more than a mere local flora, and forms a most interesting contribution to the study of the classification of the Rose.

Since the days of Linnæus we find two great periods of advance in the study of *Rosa*. First, the early years of the nineteenth century corresponding approximately with the issue, under the care of Joseph Sabine, of the first series of "Transactions of the Horticultural Society," and marked by the names of De Candolle, Desvaux, and Rau, in France, and Lindley, Woods, Sabine, and Lyell in England; and, secondly, with the decade of the 'seventies, a period quite remarkable for its wealth of Rose literature. To mention only a few of these writers: about this period appeared Dr. Christ's "Roses of Switzerland"; Regel's "Tentamen," a review of the whole race of Roses; Baker's "Monograph of British Roses"; Crépin's "Materials to serve for a History of the Rose"; and Gandoger's "Tabulae Rhodologiae."

Are we at the beginning of a fresh advance? It almost seems as if we might hope this to be the case. To begin the new era, and first in point of importance, Baker gave us in 1905 a "Revised Classification of Roses" in the "Journal of the Linnean Society," probably the clearest and simplest system yet devised, being in effect an extension

to the whole Rose family of the system suggested by Woods in the early days of last century for the purpose of his study of English Roses. About the same time, in the twenty-seventh volume of this JOURNAL, appeared from the pen of M. Gérome a description of the classification of M. Crépin, a system of the greatest interest, and one which has been adopted by M. Jules Graveraux as the basis of his Catalogue of Roses grown at the Roseraie de l'Hay; but Crépin's system is perhaps deficient in the element of simplicity so essential for the aid of the student. For instance, Crépin's first division of Roses into normal and abnormal types presupposes a knowledge possessed by few even of those experts who have given years to the study of the Rose, and makes it almost impossible for the student.

Now we have the work before us, even while Major Woolley Dod's review of English Roses is making its appearance in the "Journal of Botany," and rosarians are looking forward with interest to the appearance of a work on the "Species" from the pen of an English lady whose capacity for handling this difficult subject is well known.

Dr. Schwertschlager tells us his interest in wild Roses began from botanical and geological excursions, the results of his repeated expeditions being usually submitted to Crépin for comment and direction; but it is interesting to note that it is Baker's arrangement that our author has in substance adopted for the purposes of the work before us, though he considers that Baker has given too little attention to characteristic differences in the leaves. The species found in the Bavarian Highlands correspond very much with those of Great Britain, but include in addition to those of this country *Rosa gallica* and some varieties of *R. cinnamomea*, including *alpina*.

In his "Introduction" Dr. Schwertschlager carefully describes the district he has selected, its geological and geographical character and climate. He then divides the body of his work into three parts. In the first he discusses systems of classification and the relative value to be given to different organs of the Rose, such as the stem, hairs, leaves, flowers and fruit, for the purpose of arrangement. The second part is devoted to a description of the roses found in the district, followed by a "diagnosis" of each variety and a description of the position in which it was found.

In the third part of his book, in some respects the most interesting portion of it, the author treats of the effect of external influences in producing modifications of the Rose, and afterwards applies the results arrived at to the various forms of roses he has found in his district, distinguishing between the effect of external influences and the inherent characteristics of the varieties, with a view to obtain material for ascertaining the means and modifications by which they have severally been produced. How far he has succeeded must necessarily, in our present state of knowledge, be a matter on which opinions will differ, but the candour and caution with which the results are stated should go a long way to obtain for his views the careful consideration of students of *Rosa*.

It may be laid to the account of the industry of Dr. Schwertschlager that he has discovered in his district and described no fewer than 256 varieties, of which 142 are attributed to *R. canina*, including *R. tomentella*, and this without counting some fifty hybrids which are also described and catalogued.

Dr. Schwertschlager's treatment of *R. canina* is not without interest, and here he departs somewhat from Baker's arrangement. He divides the species into two sub-sections, *R. tomentella*, which approximate more or less to the Sweetbriars (corresponding to Baker's sub-division *Sub-rubiginosae*), and *Eucaninae* or *Caninae* proper, the latter being again sub-divided into four divisions, or rather two primary divisions, each of which is again sub-divided. In the first division the stipules are small, the flower-stalk long, the sepals turned back and the stigma lengthened—when the leaves are hairless we have *canina* (Baker's *lutetiana*), when they are hairy, *dumetorum*. In the second division the stipules are strong, the flower-stalk short, the sepals "sub-persistent," *i.e.* they last longer on the fruit and are not so reflexed, and the stigma is short and woolly. In this division we find a similar sub-division: if the leaves are without hairs we get *glauca*, and if hairy *coriifolia*.*

These various sub-divisions are again divided into very numerous varieties, the distinctions between them being based for the most part on the greater or less woolliness of the stigma, the single or double toothing of the leaves, and the presence in greater or less quantity, or the absence of glands or of hairs on various parts, *e.g.* the flower stalk or the underside of the leaf. Admitting the value of dividing *Caninae* into the sub-sections and sub-divisions above mentioned, it remains a question whether there is much to be gained by the extremely minute division into varieties adopted by the author. Lindley refused to accept such characteristics as the presence or absence of pubescence or single or double serratures in the leaves as being sufficient to establish specific distinctions, and it is well known that Crépin towards the end of his life declined to trouble himself with a too minute division of *canina* forms.

The highly interesting third part of Dr. Schwertschlager's book goes some way to confirm the accuracy of this view. For instance, in considering the effect of external agents on Roses he shows that great quantities of moisture result in increasing the number of glands and the serratures of the leaves of a rose. Thus a rose which in a dry summer is found with few or no glands may in a wet one, such as 1872, be found glandiferous. It may not be at first obvious how wet should affect the serratures of the teeth, but the explanation is this: while the primary teeth are generally glandless the secondary or tertiary teeth are tipped with a gland, and so in increasing the serratures of the teeth the plant obtains a greater number of glands. Hairiness.

* In his treatment of English roses Major Woolley Dodd has adopted an arrangement substantially similar to this save that he groups *tomentella* and its allies as the first of five sub-groups of the *Eucaninae* under the title of *R. Borreri*.

again, is a protection both from rain and excess of light, and may be affected by external influences.

An interesting part of Dr. Schwertschlager's book is that in which he deals with the relative periods of blossoming, leaf opening in spring, and ripening of the fruit in autumn of the different species. In order to get over the differences in these respects caused by situation and aspect the author has stated these periods in the tables he gives, not in days of the year, but with reference to the occurrence of the like event in the nearest bush of *R. canina* which, as being the most widely distributed, is taken as a standard for the others.

The later chapters of the book deal with the problem of descent, and here the author does not confine himself to European Roses, but passes in a general review the whole race and their geographical distribution, concluding with a forecast of the probable lines of development of the species.

"A Simple Method of Bottling Fruit at Home." By J. Stoney, F.R.H.S. 8vo., 30 pp. (Mort, Stafford, 1910.) 6*d*.

To those in search of a handy little book on the housewifery occupation of fruit bottling and the like we can heartily recommend this. The author very lucidly expounds the principles upon which successful preservation of fruits depends and clearly directs as to methods to be employed. He points out that the work may be done with a minimum of apparatus, the only special appliances really necessary being proper bottles and a thermometer. Some recipes for the making of jam, wines, and pickles are added by Mrs. Stoney.

As the book is so excellent, we cannot but regret that the author did not also include the bottling of certain vegetables.

COMMONPLACE NOTES.

By the Secretary, Superintendent, and Editor.

Seaside Planting.

Colonel J. G. Sandeman, M.V.O., the position and nature of whose garden on Hayling Island are described in the following note, has kindly furnished us with a list of trees and shrubs which he has found, after many trials, to succeed in a wind-swept situation near the sea. We have no doubt his experience will prove valuable to others who are making gardens in similar situations.

"The choice of plants for seaside planting must depend a good deal upon soil and aspect. Here I have worked upon a few inches of soil artificially laid upon a bed of sandy shingle 350 yards from high-water mark and 20 feet above sea-level in the centre of Hayling Bay. The prevailing wind is south-west, in which direction is the open sea for five miles to Bembridge, from which it is again three miles to the eastern downs of the Isle of Wight, which at this distance afford no protection from the wind.

"The plantation is protected on the north by a 7-foot wall, from the north-east by the house, and from the east by a low artificial mound on which are some *Pinus austriaca* and *P. maritima*, 10 to 11 feet high, and partly protected on the west by a wooden trellis 8 feet high. The plantation is quite open to winds from the S.S.E. to W. by N.

"The only plants that I have found of any use for the first line of defence are *Euonymus japonicus*, Tamarisk, Gorse, *Lycium*, oval-leaved Privet, *Salix alba*, Alder, and *Phillyrea latifolia*. To these I hope to add later on *Fagus antarctica* and *Rubus australis*. With the protection afforded by these I have planted many kinds, amongst which I may mention Sea Buckthorn, *Atriplex Halimus*, wild Cherry, Evergreen Oaks, Elders, Sycamore, *Pinus austriaca*, *P. maritima*, and *P. atlantica*, *Salix Caprea*, *Phillyrea Vilmoriniana*, Thorns, Wych Elms, *Caragana arborescens*, *Halimodendron argenteum*, Holly, *Griselinia littoralis*, several sorts of Berberis, *Cupressus macrocarpa* and *C. m. lutea*, *Escallonia macrantha*, *Phillyrea ilicifolia*, *Pernettya mucronata*, Silver Poplar, *Pyrus prunifolia*, *Cornus sanguinea*, *Rubus nutkaensis*, besides a good many others.

"In tolerably sheltered situations protected from the north only by a 6-foot wall, I have, amongst many other more common flowering shrubs, *Pittosporum Mayi*, *Ceanothus dentatus*, Veronicas of many kinds, including the var. Séduisante, given me by Mr. Andrew Kingsmill, *Daphniphyllum glaucescens*, several kinds of *Olearia*, *Cistus florentinus*, *Leycesteria*, Lilacs, *Prunus Pissardii*, *Pinus excelsa*, *Rhus Cotinus*, *Chenopodium*, and *Bupleurum fruticosum*.

"In the selection of plants I have had to consider the poverty and shallowness of the soil, and in the most exposed situations the plants are very crowded, but as water exists 8 to 10 feet from the surface, it is only the top soil that becomes very dry; this is counteracted by rotary sprinklers worked by a Dando mill which is driven by, perhaps, our worst enemy, the wind, so that we may say with truth that 'It's an ill wind that blows nobody some good.'

"Next year I hope to plant out Hickory, *Maclura auraniiaca*, *Xanthoceras sorbifolia*, and *Decaisnea Fargesii*, all raised here from seeds.

"*Eucommia ulmoides* seems to be quite hardy here.

"I don't stint fertilizers, but I use plenty of guano, nitrates, and phosphates, by which I obtain rapid growth."

Lilium monadelphum var. Szovitzianum (=L. colchicum).

For general usefulness this lily (figs. 126 and 127) has probably no equal, and in beauty it is nearly, if not quite, equal to *L. auratum*. It seems equally at home in sun or shade and in fairly damp and in dry positions, growing from three to six feet high, with five to twenty blooms on a graceful stem strong enough to support them without staking. The colour of the flower is a bright straw yellow, some being almost a canary yellow, others clear self colour, while still others are spotted with black, the anthers being a deep chocolate. The individual flowers are large and somewhat pendulous, giving a particularly pleasing effect. At Wisley this is one of the earliest lilies to bloom, and thrives best in a cool position where the soil contains a good deal of humus; at the same time it should be added that, though smaller, it is perfectly happy on dry banks, but flowers there a fortnight later and grows a little less vigorously. In one position, under some large apple trees in a poor soil, the stock increases rapidly, hundreds of seedlings coming up every year. Another merit this lovely lily possesses is its healthy constitution, disease very rarely attacking it, and even then only very slightly. For both large and small gardens it is one of the best and most reliable of all lilies, and may be depended upon to produce plenty of flowers in June.

Alpine Strawberries (Quatre Saisons).

Considering the extraordinary quantity of delicious fruit borne by the Alpine Strawberries, and their easy cultivation, it is strange that they are so seldom seen, even in the gardens of the very rich. Fruiting as they do so continuously, and after the other large-fruited varieties are done, they form a welcome and pleasant dish on the dessert-table, and are delicious in a fruit salad. Tastes fortunately differ, but in our opinion the small White Alpine is the best flavoured of all, and the largest we have seen is 'Millett,' a new variety raised, we believe, in France, the fruit being of the usual shape of the alpine varieties and about two inches long. Other good varieties are 'Bergeri,' 'Belle de Meaux,' and the 'Pearl,' all of which may be propagated by runners,

which should be planted out where they are intended to fruit, in August or September, or the runners may be planted thickly in a nursery bed and then planted out in March. Another plan involving less trouble and equally satisfactory in results is to procure seeds of Alpine Strawberries and sow them in cold frames in the autumn, or in heat in January, and plant out early in the spring where they are to fruit, but whether grown from runners or seeds these plants are best treated as annuals. A rich soil is essential, with good drainage and a warm sunny position, for the plants to do themselves justice and to produce fruit of the highest flavour.

FIG. 126.—LILIUM MONADELPHUM VAR. SZOVITZIANUM.

(*To face page* 444.)

CARNATIONS AT WISLEY, 1909-1910.

A NUMBER of stocks of both Tree and Malmaison Carnations were sent for trial, all of which were grown on into large plants, and all flowered profusely through the winter, spring, and early summer of 1910. No awards were made after the trial, as it was found all the best varieties, both of the Tree section and the Malmaisons, had already received awards from the R.H.S.

At the end of May some of the plants that had been flowering through the previous winter were planted out in a sunny position, and although the foliage lost colour a little, a great quantity of large and useful blooms were produced by the plants, and they promise to continue flowering indefinitely. Instead of throwing away the old plants of Tree Carnations in the spring we would suggest planting them out in a sunny place for cut flowers during the summer and autumn.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

TREE CARNATIONS.

Afterglow (Engelmann).—Bright rosy cerise; flowers of firm texture, borne on long stems.

Alvina (Engelmann).—Deep glowing pink; a remarkably strong grower and free bloomer; has a good stiff stem.

Andrew Carnegie (Engelmann).—Scarlet slightly tinged with rose; flowers large; petals deeply serrated.

Apple Blossom (Engelmann).—White faintly tinged with rose; flowers of medium size; petals slightly cut; calyx bursts.

Aristocrat (Engelmann).—Deep cerise pink; flowers large; calyx good and stem erect.

Bay State (Engelmann).—White pencilled with carmine; flowers large, 3 inches in diameter; plants very vigorous in habit.

Beacon (Engelmann), **A.M.** October 29, 1907.—Scarlet tinged with rose; flowers large; petals broad, slightly indented; calyx sometimes bursts.

Bonnie Maid (Engelmann).—Pale rose, fading to white at the edges of the petals; flowers of medium size, clove-scented; calyx good.

Carola (Engelmann), **A.M.** May 25, 1909.—Flowers large, rather flat; petals somewhat crowded in the centre but loose towards the outside, coarsely indented; it was strongly clove-scented as grown at Wisley, but the calyx was inclined to burst; deep crimson.

Defiance (Engelmann).—Bright scarlet; flowers large, rather crowded in the centre; calyx good.

Delight (Engelmann).—Salmon-pink; flowers of medium size and of good form and substance; calyx good.

Enchantress (Low). **A.M.** November 29, 1904.—Delicate pink, with slightly darker centre; flowers large on long stems.

Faust (Engelmann).—Scarlet tinged with rose; flowers large, faintly scented; petals much serrated; calyx good.

Fiancée (Engelmann).—Pink; flowers large, loose; petals much indented; calyx bursts.

Floriana (Low).—Rose-pink; petals deeply indented; strongly scented.

Glendale (Engelmann).—White marked with pink; flowers large; calyx good.

Harlowarden (Engelmann), **A.M.** April 11, 1905.—Bright crimson; flowers large, crowded in the centre; much scented; petals coarsely indented; calyx good; stems long and rigid.

Harvard (Engelmann).—Crimson; calyx good; flowers large, borne on stout stems.

Helen M. Gould (Engelmann).—White tinged and flaked with rose; flowers large, strongly scented; calyx bursts.

Imperial (Engelmann).—Very pale pink striped with rosy pink; flowers large, round, rather full in the centre, slightly scented.

Jessica (Engelmann), **A.M.** April 30, 1907.—White marked with thin scarlet lines; flowers large, slightly scented; calyx burst in very large flowers.

Lady Bountiful (Low), **A.M.** May 9, 1905.—White tinged with pink; flowers medium, scented.

Mabelle (Engelmann).—Pale pink; petals of poor form and substance; a weak grower.

May (Engelmann).—Pink; flowers small, borne on long stems; calyx bursts.

May Bennett (Engelmann).—Deep rose edged with white; calyx bursts.

Mauve Queen (Engelmann).—Heliotrope; flowers large, of good form and substance; plant bushy in growth; flower-stems stiff and erect.

Melody (Engelmann).—Pale pink; flowers medium, of good form; flower-stems stiff and erect.

Mrs. C. Knopf (Engelmann).—Salmon-pink; flowers large, strongly scented; petals broad, much twisted, slightly cut; calyx inclined to be weak.

Mrs. T. W. Lawson (Low), **A.M.** November 6, 1900.—Pink; flowers large, strongly scented; flower-stems stiff and erect; plants vigorous in growth.

Mrs. M. A. Patten (Engelmann).—White striped with rose; flowers large, of good form and substance; in the largest flowers the calyx bursts.

Mrs. Vaughan (Engelmann).—White tinged with rose, and tinged with cream in the centre; flowers large, very loose; petals much cut; calyx bad.

My Maryland (Engelmann).—White slightly tinged with rose; flowers large, circular; petals broad, of good substance, slightly cut; calyx good.

O. P. Bassett (Engelmann), **A.M.** September 28, 1909.—Blood-red; flowers small; petals deeply fringed; calyx good.

Pink Imperial (Engelmann).—Rosy magenta, tinged with a slightly deeper colour; flowers large; petals slightly cut; calyx bursts.

Pink Patten (Engelmann).—Bright pink; sport from 'Mrs. M. A. Patten,' which it resembles in all but colour.

President (Engelmann).—Deep crimson; flowers large, borne on stiff stems; a strong and vigorous grower.

Prosperity (Engelmann).—White marked with rosy scarlet; flowers large, strongly scented; petals much cut.

Red Lawson (Engelmann).—Scarlet; flowers large, slightly scented; petals broad, slightly indented; calyx generally good.

Red Riding Hood (Engelmann).—Strawberry-red; flowers small; calyx inclined to split.

Robert Craig (Engelmann), **A.M.** October 26, 1906.—Scarlet; flowers large, of fine form, strongly scented; petals broad; calyx and stems good.

Rose Pink Enchantress (Low), **A.M.** October 29, 1907.—Rose-pink; flowers medium; flower-stems stiff.

Ruby (Engelmann), **A.M.** August 11, 1891.—Scarlet-crimson; flowers large.

Sarah Hill (Engelmann).—White; flowers large, borne on strong stems; calyx good.

Splendour (Engelmann).—Pale rose; flowers medium-sized; petals broad, much indented; calyx good; a weak grower.

Superior (Engelmann).—Pale rose; flowers large; petals broad, somewhat serrated; calyx bursts; a good grower.

The Cardinal (Engelmann), **A.M.** October 24, 1905.—Crimson; flowers of medium size; petals broad, much indented; calyx and stems good.

Variegated Lawson (Engelmann).—White flaked with rose; flowers large, slightly scented; petals broad.

Victory (Engelmann), **A.M.** October 24, 1905.—Scarlet, slightly tinged rose at tips of the petals; flowers large, rather loose in centre, strongly scented; petals very broad; good calyx.

Viola Sinclair (Engelmann).—Rosy magenta; flowers medium-sized; petals slightly cut; calyx splits.

Wanoka (Engelmann).—Crimson, slightly paler than 'Harlowarden'; flowers of medium size, very full in centre, sweetly scented; petals much cut; good calyx.

White Enchantress (Low).—Pure white; a sport from 'Enchantress'; very full in the centre.

White Lawson (Engelmann, Low).—Pure white; a sport from 'Mrs. Thomas Lawson'; very strongly scented.

White Perfection (Engelmann), **A.M.** October 23, 1906.—White; flowers large, strongly scented; calyx good.

Winona (Engelmann), **A.M.** September 29, 1908.—Rosy pink; flowers large, faintly scented; petals broad, of good substance; calyx good.

Winsor (Engelmann), **A.M.** October 29, 1907.—Pink; flowers of medium size, slightly scented; petals serrated; calyx good.

Malmaison Carnations.

Albion.—Flowers medium; deep salmon, scented; dwarf robust habit.

Calypso, **A.M.** July 12, 1898.—Flowers medium; soft pink with salmon centre, petals splashed with deeper pink, scented; stems very long and erect.

Duchess of Westminster, **A.M.** May 21, 1902.—Flowers medium; pale rose-pink, strongly scented.

Flora.—Flowers medium; white tinged with pale pink; stems long; bushy habit.

Florizel, **A.M.** June 13, 1899.—Flowers medium; deep rose; petals large, leaves broad.

Grace.—Flowers medium; pink marked with rose.

Horace Hutchinson.—Flowers medium; deep salmon, scented; bushy habit.

Lady Grimston, **A.M.** May 19, 1896.—Flowers large; pale rose flushed with pink, strongly scented; vigorous habit.

Lady Rose, **A.M.** June 13, 1899.—Flowers large; bright rose; petals large; robust habit.

Monk.—Flowers medium; salmon; bushy habit.

Nautilus.—Flowers rather small; pale pink.

Prime Minister.—Flowers medium; brilliant scarlet; petals large, leaves narrow; very bushy habit.

Princess of Wales.—Flowers large; deep pink, scented.

Robert Burns.—Flowers medium; bright salmon, scented; leaves very broad; vigorous habit.

Border Carnation.

Cecilia.—Flowers medium, bright yellow, produced on very long stems; seldom splitting its calyx when grown in pots; flowers late.

PELARGONIUMS AT WISLEY, 1910.

A good collection of these old-fashioned and beautiful plants were sent by Messrs. Dobbie and Sir Trevor Lawrence, Bart., V.M.H. All were grown in a span-roofed house, in pots 6 or 7 inches in diameter. All the stocks grew well, making large bushy plants, absolutely covered with blossoms that were much admired by visitors. 'Gold Mine' appeared to be the most general favourite. These plants are very easy to grow, and if attacked by insect pests fumigation or dipping in a good insecticide will quickly clear them.

A.M. = Award of Merit.

Albert Victor.—Flowers large, light geranium edged with white; centre white, upper petals with dark markings; a very pretty, free-flowering, vigorous variety.

Alexandra.—Flowers medium, very pale mauve rose, almost white, streaked with magenta; upper petals dark crimson edged with pale mauve rose; a vigorous, free-flowering variety.

Beauty.—Flowers medium, rose; upper petals deep crimson; a pretty variety and a strong grower.

Boyes, W. R.—Flowers large, crimson carmine; upper petals streaked with purple garnet.

Devise.—Flowers of medium size, semi-double, pure white.

Duke of Fife, **A.M.** 1889.—Flowers very large, geranium with a very narrow edging of white; centre white; a free-flowering, vigorous variety.

Edward Perkins.—Flowers small, scarlet magenta; upper petals beautifully marked; free-flowering.

Emperor of Russia.—Flowers of medium size, deep purple shading to magenta and rosy mauve at the margin; a vigorous and free-flowering variety.

Gold Mine.—Flowers of medium size, Turkey red, upper petals darker; a very vigorous grower.

Hybrid from Aurora.—Flowers medium, rose Neyron red, with dark markings on upper petals; free-flowering.

Kingston Beauty.—Flowers large, white, upper petals blotched with deep rosy magenta; very free-flowering.

Le Vesuive.—Flowers medium, light geranium lake, upper petals curiously marked with crimson and magenta; a very free-flowering and good decorative variety.

Miss E. Terry.—Flowers medium, pink, upper petals deep crimson.

Mrs. Harrison.—Flowers large, semi-double, white ground covered with cerise pink markings; a very vigorous and free-flowering variety.

Mrs. Lion.—Flowers of medium size, pure white, petals much crumpled.

Old Unique.—Flowers small, rose Neyron red; upper petals dark crimson; foliage slightly scented.

Pearl.—Flowers very large, 2½ inches across, pure white; upper petals faintly streaked with magenta; a good and very free-flowering variety of vigorous habit.

Prince George.—Flowers white, medium; petals streaked with magenta; a free-flowering variety.

Princess May, **A.M.** 1892.—Flowers large, 2½ inches across, crimson pink with a regular dark crimson blotch on each petal; a very charming variety of great decorative value and free flowering habit.

Persimmon, **A.M.** 1896.—Flowers large, semi-double, cardinal red; the upper petals having dark markings; a vigorous grower.

Purple Emperor.—Flowers large, 2½ inches across, rosy magenta; upper petals marked with dark crimson; a very showy, free-flowering variety of vigorous habit.

Queen Wilhelmina.—Flowers large, lilac, upper petals marked with a darker shade; vigorous habit.

Regalia.—Flowers medium, deep rose streaked with magenta.

Rosetta.—Flowers medium, light rosy magenta, upper petals beautifully marked with a darker shade; very free-flowering.

Rose Queen.—Flowers large, 2½ inches across, pale purple rose, upper petals marked with deep crimson; a very free-flowering and vigorous variety.

Scarlet Unique.—Similar to ' Old Unique ' in shape and size but of a deep crimson colour.

Sir Trevor Lawrence.—Flowers large, 2½ inches across, reddish purple beautifully veined and blotched with velvety black; a very free-flowering variety of vigorous habit and a decided advance on the older dark forms.

The Bard.—Flowers very large, 2¾ inches across, Solferino red, upper petals darker and blotched with dark crimson; a good vigorous grower and very free-flowering.

Triomphe de St. Maude, Improved.—Flowers very large, 3 inches across, strawberry red, upper petals of a much deeper shade and blotched with dark crimson.

Venus.—Flowers large, white, upper petals marked with magenta; a free-flowering variety.

EXAMINATIONS IN HORTICULTURE, 1910.*

GENERAL EXAMINATION.

Wednesday, April 20, 1910.

Seniors: over 18 years of age.

One hundred and seventy-four candidates in the British Isles and eleven candidates abroad entered for the Society's Senior General Examination, held on April 20, 1910. Seven of these, however, did not present themselves on the appointed date.

The Examiners, the Rev. Professor Henslow, V.M.H., and Mr. James Douglas, V.M.H., report that of the 165 English candidates securing a place in the Pass List, 42, or 25 per cent., secured places in the first class; 88, or 53 per cent., obtained the second class; while 35, or 22 per cent., appear in the third class.

Of seven candidates in India, four were placed in the second and three in the third class.

Of four in South Africa, two were placed in the first, and two in the third class.

Comparing the results of the questions in Section A with Section B, it was found that 43 excelled in A, or 25 per cent., and 55 in B, or 31 per cent.; while 57 were within 10 marks of each other, or 32 per cent.; and, lastly, 21 candidates obtained exactly the same total number of marks in each paper, *i.e.* 12 per cent.

Cases of wide variation in the marks secured in the two sections were very few, and were mostly confined to the third class. These results, therefore, seem to indicate that candidates had studied both the theoretical and practical sections of the syllabus with equal attention, a slight balance in favour of practical knowledge (Section B) over physiological (Section A) being perhaps perceptible.

Students always show a marked preference for certain questions, as the following results will show: Of the eight questions of the A paper —dealing with (1) soils, (2) air, (3) light, (4) water, (5) classification, (6) root anatomy, (7) fertilization, (8) fruit dispersal—there was an evident bias towards the questions (2), (4), (6), and (8). The numbers of candidates who selected these were 117, 97, 107, and 149, respectively; whereas the *average* number who answered one or more of the other four questions was 42 only.

Similarly of the eight questions of the B paper, numbered (9) soils, (10) soils and fruit, (11) soils, good and bad, (12) budding and grafting, (13) plants for forcing, (14) orchids, (15) vegetables for forcing, (16) herbaceous borders—the preferences were for (9), (10), (12), and (15).

* See also p. 214.

The numbers of candidates selecting these were 142, 137, 130, and 111, respectively. The *average* for the other four questions was 45.

Speaking generally of the results of the A paper of the Seniors, a marked improvement was evident. The answers were, on the whole, accurate, clear, and well expressed, giving the impression that candidates had studied intelligently and were really interested in their work.

The Examiners wish to acknowledge the care taken to comply with the rules laid down for the examination, especially in details such as answering each question on a separate sheet of foolscap, whereby much labour has been saved them.

Juniors: under 18 years of age.

Of one hundred and twelve Juniors, eight were placed in the First, twenty-nine in the Second, and thirty-seven in the Third Class; while twenty-one have been placed in a Fourth Class. Those securing less than 25 per cent. of the full marks do not appear in the list.

In 1909 there were seventeen in the First, forty-one in the Second, and sixty in the Third Class, while twenty-two are recorded as having failed.

This comparison is highly satisfactory, for, considering the decrease in candidates, the number in each class shows only a due variation in view of this year's Syllabus demanding a wider range of knowledge by the theoretical section being made compulsory, and the influence of this on the marking.

As with the Seniors, the Juniors showed marked preferences for four, if not five, questions. Thus 100 answered Question (9), 82 (10), 66 (12), and 60 (11); but 55 answered (15). A like resemblance to the Seniors occurred also in the small number of replies given to Questions 13, 14, and 16.

The quality of the answers was that to be expected from beginners. Attention is called to inaccuracies in the spelling of botanical terms. Great care should be taken to learn these correctly when first heard or read, as early errors often cling to the memory and are hard to eradicate.

W. Wilks, *Secretary*.

SENIORS.

Class I.

1. Glavin, J., 82 Micklehurst Road, Mossley, Manchester.
2. Lockhart, T. A. M., Mount Harriet Cottage, Stepps, Glasgow.
   Lonsdale, G. W. T., School House, Tilford, Farnham.
   Turner, J., Beechfield, Bathampton, Bath.
5. Ascroft, R. W., University College, Reading.
   Clough, H. F., R.H.S. Gardens, Wisley.
   Corry, A., Studley College, Warwickshire.
   Dell, B., Horticultural College, Swanley.
   Ekins, E. H., Studley College, Warwickshire.
   Grover, G. M., Horticultural College, Swanley.
   Wallace, A. E., University College, Reading.
   Watt, A. M., Milton School of Gardening, Weston-super-Mare.

Alderson, L. C., Horticultural College, Swanley.
Blaauw, F. J. W., St. George's Hostel, University College, Reading.
Garlick, F. H., Horticultural College, Swanley.
Horniblow, M. E., University College, Reading.

Brice, H. H. W., The Hollies, Castle Cary, Somerset.
Brothers, W. J., Winton, King's Avenue, New Malden.
Brown, W. H., 50 Albert Road, Tamworth.
Ford, M. E., Studley College, Warwickshire.
Hickman, A., University College, Reading.
Nicholls-Jones, M., Studley College, Warwickshire.
Owen, V., Horticultural College, Swanley.
Penney, I. C., Thatcham Fruit Farm, Newbury.
Simmonds, A., R.H.S. Gardens, Wisley.
Sutton, H., Moat Bank, Burton-on-Trent.
Trim, H. W., Bylands, Wrecclesham, Farnham.

Berryman, E., Abbots Bromley, Rugeley.
Brazier, R. L., R.H.S. Gardens, Wisley.
Douglas, M., Thatcham Fruit Farm, Newbury.
Harbor, A. E., University College, Reading.
Irwin, W., College of Agriculture, Holmes Chapel, Cheshire.
Lambourne, J., 69 Gloucester Road, Kew.
Mansell, C. R., Badshot Lea, Farnham.
Naef, L., Horticultural College, Swanley.
Osborne, P. V., County Laboratories, Chelmsford.
Phillimore, E., Horticultural College, Swanley.
Phillips, F. A., R.H.S. Gardens, Wisley.
Rodney, P., The Hill, Almondesbury, Bristol.
Sherlock, T., The Gardens, Lissadell, Co. Sligo.
Soppitt, H. P., 29 Burton Road, Kingston-on-Thames.
Walker, F. W., Thatcham Fruit Farm, Newbury.

Class II.

Clark, E. E., Thatcham Fruit Farm, Newbury.
Cook, A. W. K., Thatcham Fruit Farm, Newbury.
Grimwood, J. C., Alresford, near Colchester.
Hendry, D., City Parks Department, Cardiff.
Marks, A. T., Ivy Cottage, Weydon Hill Road, Farnham.

Baring, G. (Hon. Mrs.), St. Cross Mill, Winchester, Hants.
Borrill, M., 36 Laneham Street, Scunthorpe.
Davidson, H. W., Arlesey House, Arlesey, Hitchin.
Heymann, H., University College, Reading.
McQuade, H., Hope Cottage, Penymaes, Holywell.
Milne, C. M., Horticultural College, Swanley.
Moyes, E. J., Weeley Heath, Weeley, Colchester.
White, G. C., University College, Reading.

Braddy, G., West Street, Wrotham, Kent.
Brierley, J. H., 1 Milford Street, Rochdale.
Burgess, C. E., Horticultural College, Swanley.
Butcher, P. G., 2 Luxford Street, Rotherhithe, S.E.
Cartwright, W., R.H.S. Gardens, Wisley.
Dümmer, R. A., 5 Mortlake Terrace, Kew.
Dyer, J., Horticultural College, Swanley.
Eggar, E. C., The Yellow House, Firgrove Hill, Farnham.
Figgis, G., The Yews Lodge, Whitehill, Bletchingley.
Jarrett, J., Queen's Park, Harborne, Birmingham.
14. Oliver, W. C., Stotsfold, Hexham, Northumberland.
Powell, D. J., R.H.S. Gardens, Wisley, Ripley.
Preece, S. I., University College, Reading.
Priest, S., Chichester Lodge, Stone, Greenhithe.
Robson, R. McK., R.H.S. Gardens, Wisley, Ripley.
Simms, P. J., The Schools, Windlesham.
Smith, E., Lissoy, Highbury Road, Wimbledon.
Watters, L., Horticultural College, Swanley.
White, W. C., The Gardens, Brocket Hall, Hatfield.
Young, R. J., 22 Prince's Road, St. Albans.

Baumgartner, C., University College, Reading.
Carr, A., Horticultural College, Swanley.
Colledge, J., The Gardens, Silksworth House, Sunderland.
Henry, M., Thatcham Fruit Farm, Newbury.
Mansbridge, F. W., 11 Church Road, Bagshot.
34. Mason, J. W., 27 Arthur Street, Withernsea, E. Yorks.
Middlemiss, T. J., 51 Clement's Road, Bermondsey, S.E.
Roger, R. V., Wootton Cottage, Egglescliffe, R.S.O.
Stokes, E. W., R.H.S. Gardens, Wisley.
Tribe, H., 6 Hedgley Street, Lee, S.E.
Vinall, L. E., 2 Ditton Hill Terrace, Surbiton.

Bowyer, F., R.H.S. Gardens, Wisley.
Everitt, M., Horticultural College, Swanley.
Gibson, G. W., R.H.S. Gardens, Wisley.
Golden, J. N., The College, Holmes Chapel.
45. Hemingway, D. F., Thatcham Fruit Farm, Newbury, Berks.
Milner, M. H., Elmwood School of Gardening, Cosham.
Parish, W. E., Gorton, Fairfield, Farnham, Surrey.
Williams, F., 27 Ruislip Street, Tooting.

Beale, H. E., R.H.S. Gardens, Wisley.
Carkey, E. H., Thatcham Fruit Farm, Newbury.
Churchman, H., Sawston, Cambs.
53. Cox, E. W., The Dell, Millbrook, Cornwall.
Lingard, A. K., 109 Wallsall Road, Darlaston.
Moss, H., 19 St. Albans Road, Colchester.
Wood, A. C., Eggbuckland, Crown Hill, Devon.

60. Baggs, A. E., 35 Gloucester Road, Kew.
Clark, J. H., Thatcham Fruit Farm, Newbury.

Fogg, W., 228 Turton Road, Bolton.
Hiett, E. P., 310 Kew Road, Kew.
Lunan, D., 1 Beaumont Gate, Dowanhill, Glasgow.
60. Norman, H. P., City Parks Department, Cardiff.
O'Vastar, J. W., Holme Bank Gardens, Matlock Bath.
Veester, H., Horticultural College, Swanley.
Walters, P. M., Fort Qu'Appelle, Saskatchewan, Canada.

Akerhielm, M., Milton School of Gardening, Weston-super-Mare.
Aldridge, A., 1 Souldern Road, Brook Green, W. Kensington.
Blewett, J., Enys Road, Camborne.
69. Child, H. V., 310 Kew Road, Kew.
Davies, G. T. G., Stonegrave, Oswaldkirk, York.
Hope, W., West Cross, Tenterden, Kent.
Shaw, K. F., R.H.S. Gardens, Wisley.

Bannister, E., Wickham Bishops, Witham, Essex.
Copland, J., Marchbankwood, Beattock, Dumfries.
76. Judd, W. H., Wigmore, Beare Green, Dorking.
Robinson, F. A., 13 Kenilford Road, Balham, S.W.
Smith, J. G., 119 Loughborough Road, Brixton, S.W.

Gould, A. R., 69 Gloucester Road, Kew.
Haarer, A. E., R.H.S. Gardens, Wisley.
Inkson, H. C., 50 Lyndhurst Road, Chichester.
Peers, J. T., Manor Lodge, Clayton-le-dale, Blackburn.
81. Rolleston, H., Horticultural College, Swanley.
Thomas, R. H., Trebahwartha, Mawnan, Falmouth.
Watson, S. A., Clovelly, Lynwood Road, Redhill.
Wiseman, P., 31 Douglas Road, Tolworth, Surbiton.

Class III.

Day, T., The Rosery, Headstone Lane, Pinner.
1. Gibbs, S. W. H., Belmont, King's Road, Walton-on-Thames.
Rose, F. T., The Gardens, Canwick Hall, Lincoln.

4. Lane, H., R.H.S. Gardens, Wisley.
Lewis, T. H., 12 Summer Hill, Douglas, Isle of Man.

Epps, H. W., 16 Waterloo Place, Kew.
6. Fraser, G. B., 18 Eildon Street, Edinburgh.
Lynch, R. S., 17 Dagmar Road, Kingston Hill.

Baker, G. A., 298 Kew Road, Kew.
Bell, W. D., The Gardens, Wistow Hall, Leicester.
9. Hudson, J. H., Surrey Mount, Westwood Park, Forest Hill.
Lee, W. R., 97 Abbott Road, Poplar, E.
Plomer, R., The Lodge, Salcey Lawn, Northampton.

Foster, A., Thatcham Fruit Farm, Newbury.
14. Laight, R., 160 Avenue Road, Acton, W.
Smith, A. J., Sudbury House, Harrow-on-the-Hill.
Tayler, F. W., 25 Third Cross Road, Twickenham.

18. Chamberlain, A. G., City Parks Department, Cardiff.
19. Thom, C. R., Wellsgreen, Windygates, Fifeshire.

20. Horne, W., R.H.S. Gardens, Wisley.
Martin, S. J., Lord Penrhyn's Hospital Gardens, Bethesda
Carnarvon.
Patrick, P. S., R.H.S. Gardens, Wisley.

23. Howell, A., Fairmile Hatch, Cobham.
Knights, C., 145 Hilda Terrace, Suffield Park, Cromer.
Roach, W., Ravenswood, Kingston Hill.
Tyrrell, J., Castle Gardens, Cardiff.

27. Cowan, G., Drums, Langbank, Renfrewshire.
Goodman, C., Chesterford Park, Essex.

29. Stewart, W., Croppin's Park, Buckfastleigh, Devon.
Toombs, R. E., College of Agriculture, Holmes Chapel, Cheshire

31. McCourt, H. L., R.H.S. Gardens, Wisley.
Mason, H. T., c/o Mr. Payne, Waterloo Place, Kew Green.
Perry, W., 55 Gelly Flat, Trimsaran, Kidwelly.
Shell, L., R.H.S. Gardens, Wisley.

35. Blatchley, C. M., Thatcham Fruit Farm, Newbury.

SOUTH AFRICAN SECTION.

Class I.

1. Griffiths, E. W., P.O. Box 4636, Johannesburg.
2. Terry, H. B., Orange Grove, Johannesburg.

Class III.

1. Monckton, J. G., Government School, Breyton.
2. Terry, G., Orange Grove, Johannesburg.

INDIAN SECTION.

Class II.

1. Raturie, S. S., Botanic Gardens, Saharanpur.
2. Khan, M. K., Botanic Gardens, Saharanpur.
3. Varma, G. S., Botanic Gardens, Saharanpur.
Watson, F. E., Botanic Gardens, Saharanpur.

Class III.

1. Rajsud, Hans, Botanic Gardens, Saharanpur.
2. Jeddy, M. A., Kharagpur, Bengal.
3. Fordham, R. D., Botanic Gardens, Saharanpur.

JUNIORS.

Class I.

1. Blyth, C., Berechurch, Colchester.
Brooks, A., Aldenham Park Lodge, Elstree.
Combridge, D., 28 Grena Road, Richmond.

4. Aylett, R. M., 20 Faversham Road, Catford.
Henry, M., Thatcham, near Newbury.

6. Thomas, A. H., High Ongar.
7. Oliver, George, Gaia Lane, Lichfield.
   Whiting, F. C., Technical School, Chelmsford.

Class II.

1. Twinney, M. M., City Parks Department, Cardiff.
2. Betts, E., 24 Upper Park Fields, Putney.
   Gibbs, F., Clehonger, Hereford.
   Sibley, E. J., Technical School, Chelmsford.
5. Clifford, W., Wigmore Schools, West Bromwich.
6. Gascoigne, A. E., Wigmore Schools, West Bromwich.
   Stewart, James, Industrial School, Chelmsford.
8. Crane, H., 52 Paradise Road, Clapham Road, S.W.
   Spearman, B. J., Fyfield, near Ongar.
10. Briggs, I. G., Stoke Farm, Bromsgrove.
    Ireland, D. L., St. Fagan's Castle Gardens, near Cardiff.
12. Harding, F. R., Industrial School, Chelmsford.
    Richards, J., White Oak School, Swanley.
    Weiss, G., Drumpeller Gardens, Coatbridge, N.B.
    Yates, H., Stoke Farm, Bromsgrove.
16. Brackstone, E., Industrial School, Chelmsford.
17. Billingham, G., Industrial School, Lostock Junction.
    Cook, F. W., Technical School, Chelmsford.
    Laptoff, H., Industrial School, Hayes End.
    Leddra, H., White Oak School, Swanley.
21. Cork, C. F., Bungalow, London Road, Wickford.
22. Anderson, E., Chadwick Memorial School, Stanwix.
    Boulton, H., Stoke Farm, Bromsgrove.
    Kirchin, A., Chesterford Park Gardens, Essex.
    Knight, J., Industrial School, Chelmsford.
    Levy, H., Industrial School, Hayes End.
    Pilkington, W., Industrial School, Lostock Junction.
    Stratford, W. E., White Oak School, Swanley.
    Taylor, J., 20 Dagnan Road, Balham.

Class III.

1. Carroll, A., White Oak School, Swanley.
   Hall, H., Industrial School, Chelmsford.
   Inman, E., White Oak School, Swanley.
4. Aldridge, H. W., White Oak School, Swanley.
   Chatfield, W., Stoke Farm, Bromsgrove.
   Yates, G., Industrial School, Lostock Junction.
7. Mallett, J., Stoke Farm, Bromsgrove.
8. Newton, J. W., Industrial School, Lostock Junction.
   Rider, R. C., White Oak School, Swanley.
10. Bagot, E., Industrial School, Lostock Junction.
    Farthing, C. P., Industrial School, Chelmsford.

12. Birkenhead, T., Stoke Farm, Bromsgrove.
Cherrett, W. B., Stoke Farm, Bromsgrove.
Crossthwaite, D., Industrial School, Lostock Junction.
Edwards, E., Chadwick Memorial School, Stanwix.
Heathcote, P., Stoke Farm, Bromsgrove.
Levy, H., Industrial School, Hayes End.
Pittaway, G., Wigmore Schools, West Bromwich.

19. Cooper, Chas., White Oak School, Swanley.
Hilton, S., Industrial School, Lostock Junction.
Lucas, A., Industrial School, Lostock Junction.
Smith, J., White Oak School, Swanley.
Whalley, J., Industrial School, Lostock Junction.

24. Birkmyre, J., Reformatory School, Stranraer.
Emerson, F., Dudwick Park, Buxton Lamas.
Pearce, W., Industrial School, Chelmsford.

27. Braithwaite, G., White Oak School, Swanley.
Hurst, J., Industrial School, Norwich.
Mullen, D., Chadwick Memorial School, Stanwix.
Walker, S., Chadwick Memorial School, Stanwix.

31. Bennett, A., 8 Kimberley Terrace, Whitchurch Road, Cardiff.
Brown, J., Stoke Farm, Bromsgrove.
Connor, T., Stoke Farm, Bromsgrove.
Crompton, W., Industrial School, Lostock Junction.
Harris, S. W., White Oak School, Swanley.
Phillips, J., Industrial School, Hayes End.
Taylor, W. G., Fylde Farm School, Poulton-le-Fylde.

Class IV.

1. Booth, E., White Oak School, Swanley.
Butterworth, H., Industrial School, Lostock Junction.
Goodier, J., Industrial School, Lostock Junction.
Leiberman, J., Industrial School, Hayes End.
Rigg, J., Fylde Farm School, Poulton-le-Fylde.
Shields, F., Chadwick Memorial School, Stanwix.

7. Easther, W. J., White Oak School, Swanley.
FitzGeorge, J., White Oak School, Swanley.
Gilchrist, C., Reformatory School, Stranraer.
Harrington, T., White Oak School, Swanley.
Hoppus, A., White Oak School, Swanley.
Jones, J. H. N., Stoke Farm, Bromsgrove.
Rudd, S., Industrial School, Norwich.
Snowball, H., Industrial School, Chelmsford.

15. Collin, M. J., Industrial School, Chelmsford.
Day, W., Fylde Farm School, Poulton-le-Fylde.
Haley, P., Chadwick Memorial School, Stanwix.
Silverberg, A., Industrial School, Hayes End.

19. Hay, J., Reformatory School, Stranraer.
Kitchen, H., Industrial School, Lostock Junction.
Smith, A., Industrial School, Lostock Junction.

EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

April 27, 1910.

Three hundred and sixty-two candidates presented themselves for the Examination of School Teachers in Cottage and Allotment Gardening held on April 27, 1910, an increase of 75 per cent. on the previous year.

The Examiners, Mr. Alexander Dean, V.M.H., Mr. F. J. Chittenden, F.L.S., and Mr. Jas. Hudson, V.M.H., report that they have experienced much difficulty (entailing delay in the issue of the pass list) through candidates failing to comply with the printed instructions for the conduct of the examination. This applies particularly to the answering of two or more questions *on the same sheet of foolscap*, although each sheet had a plainly printed heading "*Commence each question on a fresh sheet.*" This carelessness was not to be expected from school teachers accustomed to examinations, the more so since it has not been experienced in the three examinations of the Society for gardeners held this year under precisely similar Regulations.

In Section A many candidates were too discursive, and wasted time in enlarging on the botanical or physical nature of plants rather than concisely expressing their practical knowledge of the actual cultivation, when such information only was required by the question. What diversity of opinion was given upon the quantity of seed-peas needful to sow a row thirty feet long! The Examiners were told varying measures, ranging from a quarter of a pint to a quart.

In most answers on Successional Cropping the routine was correctly described, but the replies of many showed a want of *practical* experience. Opportunity to enter the realities of applied knowledge in vegetable gardening should be sought for and found.

A marked improvement was discernible in familiarity with Fruit and Flower Culture, and there was evidence of dependence on personal observation rather than on the authority of text-books. The touch of actual practical knowledge of flowers gave a finish to the answers not perceivable in the case of vegetables.

In Section B there was also an improvement on last year, a greater proportion of the candidates having given attention to illustrative experiments. Still, many have again regarded a statement of a fact as proof of its truth, and a paraphrase of a question as an answer to it.

A frequent mistake was the addition of superphosphate of lime to the soil as a means of adding lime. It cannot be too greatly emphasized that superphosphate is an acid manure, and that the benefits following the addition of lime to the soil are never associated with the addition of superphosphate.

Candidates are recommended to the study of the physical characters of soils, and the indications given by texture, feel, and colour, and by the weeds which are natural to it. Observations upon these points are of great value as helps to a soil's proper treatment, and are within the capacity of cottagers and school children.

On the whole, facts were fairly well known, but reasons therefor were too frequently lacking.

W. WILKS, *Secretary.*

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NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

Judging by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 264, 265.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

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Reuthe, G., F.R.H.S.
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Welby, F. A., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bulletino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franc.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mendel Journal	Mendel Jour.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Orchid Review	Orch. Rev.

Journals, &c.	Abbreviated title
Orchis	Orchis.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Aliens in Middle Europe. By Prof. F. Höck (*Beih. Bot. Cen.* xxvi. 2 Abt. Heft iii. pp. 391-433; 1910).—A further list of 358 plants which have established themselves in Europe during the last five years, or which have not hitherto been recorded by the author.

During the last sixty years about 1000 species have been recorded, which is at the rate of fifteen new species per annum. By far the greater number are Composites, grasses, Leguminosae, and Cruciferae.

Most of these strangers belong to the Mediterranean or Spain, but there are some from Australia, the Himalayas, Japan, and from both South and North America. Most have been accidentally introduced and are not garden escapes.—*G. F. S.-E.*

Aloineae, Anatomy of. By Dr. F. Lange (*Bot. Zeit.* Abt. I. Heft i. and ii. pp. 1-47; with 33 figs.; Feb. 18, 1910).—These anatomical researches upon the systematic classification of the Aloineae (*Aloe, Gasteria, Haworthia, Apicra, and Lomantophyllum*) contain a full description of the microscopic anatomy of the leaf for each of the genera. This is given first in general and then in detail for 56 species of *Aloe*, 26 of *Gasteria*, 17 *Haworthia*, 4 *Apicra*, and 1 *Lomantophyllum*.

An expert botanist who is familiar with microscopic technique should be able to determine any of the species studied by the author from the microscopic anatomy of the leaf alone. Some of the distinguishing points are perhaps difficult in practice. A difference in the radial diameter of a vascular bundle of 25 micromillimetres—e.g. between 375 and 400—is not very easy to distinguish. Measurements of the thickness of the cuticle, as contrasted with that of the thickened layers of the epidermis, also seem difficult to use for diagnostic purposes, and such measurements are relied upon for the primary groups of *Aloe*.

The author discusses the question as to how far the ordinary systematic classification of the *Aloineae* is confirmed by anatomical structure, and gives a scheme showing their affinities as determined by the microscopic anatomy of the leaf.—*G. F. S.-E.*

Anemone Rusts. By E. W. D. Holway (*Gard. Chron.* xlvii. (1910), p. 67; Jan. 29).—A summary of our knowledge concerning the rust fungi attacking anemones and their alternative hosts is given, it being shown that one species has its alternative form on the plum and another on *Pyrus Aucuparia*.—*F. J. C.*

Aphides on Wheat in America. By F. L. Washburn (*U.S.A. Exp. Stn. Minnesota*, 16*th Ann. Rep.* pp. 257-280; with 15 figs.; 1908).—The "green bug" (*Toxoptera graminum*) in 1907 caused a loss of over $10,000,000 in Oklahoma. This insect was found on Indian corn and oats, and less frequently on wheat, though in small numbers almost everywhere in the grain districts of Minnesota. It is always found on the leaves.

The green fly *Macrosiphum granaria* was also discovered in practically all the grain districts of Minnesota and on all cereals, as well as on several wild grasses and on peas. Heads of "Fife" wheat were less susceptible than "blue stem." The aphides migrate to other plants, especially pigeon grass, after harvest.

In spring they are found on young grain plants, on "the inner surface of the blade of the grain." On one leaf (oats) 65 grain aphides were found. There were 14 generations up to November 8, 1907. One adult may produce 49 young. The European grain aphis (*Siphocoryne avenae*) also occurs on wheat, oats, and rye, later on pigeon grass and volunteer grains, and afterwards on winter wheat and rye.

A small Hymenopteron (*Lysiphalebus tritici*) is the chief enemy of the corn aphis, and its life-history is described. The proportion of aphides attacked by this insect (which lays an egg within the body of the green fly) was found in some cases to be 95 per cent. in a field of winter wheat.—*G. F. S.-E.*

Apple, An Insect Pest of the. By A. G. Hammar (*U.S.A. Dept. Agr. Bur. Entom., Bull.* 80, Part II.; with 12 figs.; 1909).—The paper contains a full description of the life history, appearance, and distribution of the "Cigar-case Bearer" (*Coleophora fletcherella*). The larva lives in a small cylindrical or cigar-shaped case, which is formed from the apple-leaf. The figures are very clear, and a bibliography is given.—*G. F. S.-E.*

Apple Cider, Cold Storage of. By H. C. Gore (*U.S.A. Dep. Agr., Bur. Chem., Circ.* 48; Jan. 1910; 9 figs.).—This gives the result of the first season's work, the plan being to prepare the cider in the laboratory in a manner closely approaching commercial practice, cool it quickly to 0° C., and store it at that temperature, testing samples from time to time for content of sugar, alcohol, acid, &c., as well as for the flavour. Nine varieties of apples were experimented with, the fruit purchased being of the grade commercially known as "seconds." It was observed that whereas the juices held at laboratory temperatures after pressing fermented rapidly, the process being completed in 33 to 54 days, ciders prepared from apples free from decay and given cold storage remained without noticeable fermentation for 36 to 57 days, according to the variety of apple used, a total period of 90 to 125 days elapsing before they had fermented sufficiently to be considered "hard" or "sour." With one exception (Tolman) the ciders were found to have suffered no deterioration, but rather had become more palatable during storage.

The varieties 'Golden Russet' and 'Roxbury Russet' gave the greatest sugar contents in the raw juice and developed the highest percentages of alcohol, though run very close in the latter respect by 'Ralls' (*syn.* 'Rawles Janet'), the raw juice of which gave a much smaller sugar content.—*A. P.*

Apple Culture under Irrigation. By Fabián García (*U.S.A. Exp. Stn. New Mexico, Bull.* 75; Feb. 1910; 14 figs.).—New Mexico is at the southern limit of the apple-growing belt, and though, on account of its large area and difference in altitude, a great variety of climatic and soil conditions exists, dry-farming is the general system of agriculture adopted, and it is necessary that all apple orchards should be irrigated (p. 5). Yet the apple is the most important orchard fruit in the State, being principally grown in the large valleys and in the hills, where streams can be utilized for irrigation (p. 1). The latter process as applied to orchards does not seem to be well understood, and the author says there is at present very little definite and accurate information upon it (p. 16). Full instructions are given for planting an orchard under these rather exceptional conditions, though fuller knowledge may modify them in some respect. The apple tree is not very long-lived in New Mexico, especially in the warmer valleys, nor does it attain a very large size. Until a few years ago it was free from any insect enemies (p. 36); but to-day fruit-growers in this State have to contend with many, especially the woolly aphis, the San José scale, and the codlin moth, the latter being the worst of any, and methods for dealing with them are detailed. The root of "Northern Spy" is held to be practically immune to the woolly aphis.—*A. P.*

Apple Diseases. By Charles Brooks (*U.S.A. Exp. Stn. New Hampshire, Bull.* 144; Dec. 1909; 29 figs.).—An interesting description of the germination and growth of the spores of fungi attacking the apple is given. Scab (*Venturia pomi*), fruit-spot (*Cylindrosporium pomi*), leaf-spot, black rot and canker (*Sphaeropsis malorum*), &c., are dealt with, together with other diseases and the best methods of coping with them.—*V. G. J.*

Apple Diseases: Lime Sulphur v. Bordeaux. By W. M. Scott (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 54; March 1910; 3 plates).—In recent years Bordeaux mixture has come into ill favour among American apple-growers, on account of its injurious effect upon the fruit and foliage of certain varieties, 'Ben Davis,' for instance, being so seriously russeted that often most of the fruit sprayed with it is rendered second-class. Experiments have been made for two years with a lime-sulphur solution, containing about 4 lb. of sulphur to 50 gallons of water, which may be obtained by using 1½ gallon of the commercial solution to 50 gallons of water. The results are by no means conclusive, but the writer thinks that a lime-sulphur preparation

in one form or another is destined to supersede Bordeaux mixture in the spraying of varieties of apples subject to serious injury from the latter.—*A. P.*

Apples: Fumigation for San José Scale. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 84; Sept. 1909; 2 plates and 3 figs.).—Certain European Governments prohibiting the importation of all fruits from America which show upon inspection the presence of San José scale, the fumigation of infected fruits with hydrocyanic gas has been tried, with the result that the scales have been killed without injury to the quality and appearance of the fruit, and it is believed to be practicable on a commercial scale if foreign Governments will accept the fruit so treated. An appendix gives a synopsis of the regulations in force in foreign countries relating to the importation of plants and fruits.—*A. P.*

Apple Spraying in 1908. By H. A. Gossard (*U.S.A. Exp. Stn. Ohio, Circ.* 95; Apr. 30, 1909; 8 figs.).—A summary of results from spraying experiments, with tables and figures illustrating the quantity of fruit obtained from sprayed and unsprayed trees.—*V. G. J.*

Apple Worm (*Enarmonia prunivora* Walsh), **Additional Observations on the Lesser.** By S. W. Foster and P. R. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 80, part iii.; Aug. 12, 1909; 2 figs.).—The usual treatment practised against the codlin moth has so far served to keep in check very effectively serious injury by this species.—*V. G. J.*

Ascent of Water in Plants. By P. A. Rashardt (*Beih. Bot. Cent.* xxv. 1. Abt. Heft iii. pp. 243-357; 1910).—This important paper deals with the assistance given by the living cells of the stem and petiole in the ascent of sap.

The experiments were carried out with about 800 plants, belonging to 131 different species and 59 natural orders. A great variety of herbaceous plants and shrubs (both monocotyledons and dicotyledons) were used; most were grown under natural conditions in the open air.

The method was that employed by Dixon, Ursprung, and others, and consisted in killing a certain length of the stem or petiole by means of steam, ether, or xylol.

When this was done the upper part (above the injured portion) always withered after a greater or less interval. Water still passes, however, for some time, though in greatly reduced quantity. The withering of the leaves shows, even after quite a short time, that some of the living cells are killed. It sometimes happens that the withered parts recover turgescence during the night, but the final result in 125 species of plants was death by withering.

The longer the stretch of stem or petiole killed the sooner withering took place. Plants of the same species, and in the same stage of growth, &c., withered in the same time if the part of stem or petiole

killed was of the same length. Young parts perished sooner than older ones.

The author does not think that the conducting channels are themselves injured, and that it is because of this that insufficient water is carried up the stem. Nor does he think that poisonous substances given off by the dead cells penetrate to the uninjured part. He finds no trace of any action of this kind and does not agree with Dixon, who supposed that something of this sort happened. So far as regards the stem and leaves above the injured portion, it is not a case of withering in consequence of death, but a case of death in consequence of withering. In none of his 800 plants did he find any trace of injury to the stem and leaves *below* the part killed by steam, ether, or xylol.

The living cells of stem and petiole must, in his view, give some active help in the ascent of water, but the amount of help so given (*Kraftkomponente*) by these living cells seems to vary in different plants. He does not find that they only prevent lateral exudation of water, as Ursprung supposed.

His researches do not show which particular cells or tissues are especially important in this respect.—*G. F. S.-E.*

Bacterial Soft Rots of Certain Vegetables. By H. A. Harding, W. J. Morse, and L. R. Jones (*U.S.A. Exp. Stn. New York, Tech. Bull.* 11, Nov. 1909).—This bulletin deals with a group of bacteria which cause soft rots in a variety of vegetables. Forty-three strains of bacteria isolated from six different vegetables were cultivated, and it was found that in their morphological characters and cultural characteristics, with the exception of their powers of fermenting sugars, the strains were absolutely alike. Whether they belong to one species or to many can only be answered when the study of their pathogenicity which is now in progress is completed. Mr. Jones deals with the enzyme, pectinase, which these bacteria produce, and shows how it was isolated and studied.—*F. J. C.*

Bean Production. By W. F. Raven (*U.S.A. Exp. Stn. Michigan, Bull.* 259).—Michigan occupies the first place in bean production amongst the States, and it is important for the farmers to have the best information with regard to this crop. Hence this bulletin, which gives clear and precise directions as to soils, varieties, harvesting, marketing, and threshing. The diseases noticed are the so-called "rust" or anthracnose, which can only be controlled by the use of clean seed, and the "bean blight" or bacteriosis, where, again, seed selection and crop rotation are the best remedies.—*C. H. L.*

Bee-keeping, Hawaiian, A Brief Survey of. By E. F. Phillips (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 75, part v.; illustrated). Bee-keeping is considerably practised in the Hawaiian Islands.

The colonies, numbering about 20,000, are mostly in the hands of four American corporations, but a few smaller apiaries are Japanese.

Something like 600 tons of honey (1000 in 1908) are exported annually to Europe and the mainland.

The bee-keepers, when operating on a large scale, usually "rent" the honey obtainable from large tracts, and thus set up "bee rights," which is unusual in other countries. Hawaii, though the largest island of the group, is the least developed as regards bee-culture.

Formerly the chief source of honey was the Algarroba (*Prosopis juliflora*), native "Keawe," introduced by Father Bashelot in 1837, and which furnishes not only excellent honey, but fodder in the shape of pods, and wood for fuel. It blooms from March till August.

Its honey is "water-white" and granulates easily, in spite of the warm climate.

There are now many other plants which afford honey, amongst them being the *Acacia*, *Eucalyptus*, *Catalpa*, and Logwood trees, fruit trees, pasture, crop, and forage plants, weeds, and ornamental plants.

But a peculiarity of Hawaiian honey is that two-thirds of it is produced from honey-dew, exuded by the sugar-cane leaf-hopper. This is dark amber in colour and is slightly ropy. In flavour it strongly resembles molasses from the cane juice, and readily imparts its colour and flavour to the pale Algarroba honey. It does not granulate at all. Its chemical composition is quite different from that of floral honey, and it is chiefly used in the baking trade.

The polarization of the two differs, and when, as often happens, the bees mix them in the comb, the apiarists have trouble in labelling their product correctly.

The bees prefer floral nectar to honey-dew, and forsake the latter when the Algarroba begins to bloom.

A vegetable honey-dew is produced by the Hau-tree (*Paritium tiliaceum*) from nectaries on the leaves and calyces; it is largely used for hedges.

Although advisable to try and acclimatize other honey-producing plants it should be done with caution, for the *Lantana*, introduced some years ago as a greenhouse plant, escaped, and, finding the climate congenial, has become a pest, forming dense jungles ten feet high and costing $10 an acre to clear away. Its only merit is that it secretes nectar.

In view of the low price obtained for honey and the expense of, and loss in, transit, the island bee-keepers are anxious to increase their production of wax, which, being light, costs less to carry and realizes a good price. A method has been recommended, but is yet on its trial.

No foul brood is known to exist on the islands, and to prevent its possible introduction imported queens should be placed in quarantine and imported honey should have a certificate of origin. In 1908 the Commissioners of Agriculture and Forestry in Hawaii passed regulations for the purpose of preventing the introduction of contagious diseases.—*C. H. L.*

Bermuda Grass. By Moorhouse, Burlison, and Ratcliff (*U.S.A. Exp. Stn. Oklahoma*, 18*th Ann. Report*, pp. 99-110; 1908-9).—A

full description is given of the methods of planting (roots), various types, special uses (pasture and lawns), and field trials of this grass. It compares favourably with timothy, and does well with white clover. This grass (*Cynodon Dactylon*) seems to be thoroughly hardy at Oklahoma.—*G. F. S.-E.*

Bohemia, Flora of. By Dr. Karl Domin (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft ii. pp. 247-287; with 2 tables and 7 text figs.; 1910).—This paper gives some interesting notes on the plant associations of Bohemia, and a critical discussion of some of the more difficult species. Several new varieties are described, and also a new species of Carex (*C. Valenovskyi*).

Perhaps the most interesting varieties are those of *Primula officinalis*, of which one (*montana*) has flowers 17 to 20 millimetres in diameter.

Other varieties of interest are those of *Scorzonera hispanica*, *Anemone nemorosa*, *Raphanus Raphanistrum*, &c.—*G. F. S.-E.*

Bolivia, Mountain Flora of. By Dr. T. Herzog (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft i. pp. 45-102; with 3 plates and 16 text figs.; 1909).—This paper is of very great importance to bryologists, but it is also exceedingly interesting to other botanists. The brief sketch which he gives of the affinities and distribution of the Bolivian mountain flora is not only important but unusually clear.

On the south slopes of the Cordillera are dry and arid mountain steppes, which change towards the base into a flora of thorn shrubs and giant Cacti. The northern sides of the Cordillera are absolutely different.

Here one finds lovely alpine meadows full of flowers, interrupted here and there by some moss-covered rock. At from 3000 to 2900 metres is a "Krummholz" region, rather like the zone of Alpine roses and alders found in the Alps. This is a transitional formation between the alpine cushions and the mountain woods. There is luxuriant tree-growth even at 2800 metres, especially in the steep-sided mountain valleys. This mountain forest (2700-2000 metres) is low-growing, very thick, and characterized by an extraordinary development of epiphytes. The mosses are more abundant even than in Ceylon.

In one place he gathered 113 species in two days, which would, he thinks, have been impossible even in the richest valley in the Alps.

G. F. S.-E.

Brown-rot and Plum Curculio on Peaches, Control of the. By W. M. Scott and A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 120).—The punctures on the fruit caused by the plum weevil (*Conotrachelus nenuphar* Herbst.) in the course of its feeding and egg-laying form a resting-place for the spores of the fungus of brown rot (*Sclerotinia fructigena* (P.) Schröt.) and greatly favour infection. The authors state that both these troubles can be prevented

at small cost by spraying with a combination of self-boiled lime-sulphur mixture and arsenate of lead, two or three applications being necessary.

V. G. J.

Bur Oak (*Quercus macrocarpa*). By Gifford Pinchot (*U.S.A. Dep. Agr. Forest Service. Circ.* 56; revised August 5, 1909).—This tree is one of the largest and most valuable hardwood trees in North America. It derives its name from the mossy fringe about the rim of its deep acorn cup. It grows best in deep, rich, fairly moist, and well-drained soil. The wood is very strong and durable, the heartwood making excellent fence posts and railway ties.—*V. G. J.*

Cabbage, A Strain Test of 'Jersey Wakefield.' By C. E. Myers (*U.S.A. Exp. Stn. Pennsylvania, Bull.* 96).—Two years' statistics of the cultivation of the above cabbage have been collected, with a view to fixing, if possible, the desirable characteristics of the type.

At present this cabbage, though often satisfactory, cannot be depended upon to produce good heads, is uncertain in seed germination, in the time it takes to mature, and is often untrue to type.

C. H. L.

Cabbage Hair-worm, The (*Mermis albicans*). By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 62; Revised Jy. 28, 1908; 1 fig.).—The author describes in detail the panic which spread through Tennessee and the neighbouring States in 1903, when reports were circulated on the poisonous character of the Cabbage hair-worm. Among these reports one stated that there was sufficient poison in one hair-worm to "kill eight persons."

The reports have been proved to be quite erroneous and the cabbage-worm entirely harmless.—*V. G. J.*

Canning Vegetables in the Home. By J. F. Breazeale (*U.S.A. Dep. Agr. Farmers' Bull.* 359; illus.; 1909).—The writer gives his experience of canning vegetables successfully at home. *Glass* jars with wide mouths are always advisable.

Three successive cookings of an hour to an hour and a half in a *closed* container at a comparatively low temperature are infinitely better for preserving colour and flavour than cooking for a short period at a high temperature, or for a long period in an open vessel.

A jar which has a glass cover kept in place by a wire spring is at present the best pattern on the market. With new rubber rings it can be used indefinitely.

To test the success of the operation the spring should be lowered and the jar picked up by the top. If satisfactory the top will not come off.—*C. H. L.*

Cattleya × 'Princesse Elaka.' By M. Honny (*Le Jard.*, vol. xxiv., No. 561, p. 200; July 5, 1910; coloured plate).—This beautiful *Cattleya* is a cross between *C. Mossiæ Reineckiana* and *C. aurea*. Its

petals and sepals, like the former, are pure white; it has the general form of *C. aurea*; its labellum combines the best points of both parents, having a golden throat, veined with crimson streaks, which spread at the wavy edges into a rich crimson border.—*F. A. W.*

Cedar: Rust Fungus. By F. D. Heald (*U.S.A. Exp. Stn. Nebraska, 22nd Ann. Rep.* pp. 105-127; with 15 figs.; 1909).—A very complete account (with bibliography) of the Cedar Rust fungus (*Gymnosporangium juniperi-virginianae*), which is apparently entirely destroying the pencil cedar throughout the eastern half of the State, and is also seriously affecting the apple crops.—*G. F. S.-E.*

Chenopodium amaranticolor. By E. Gadeceau (*Le Jard.*, vol. xxiv., No. 553, p. 72; March 5, 1910; with 2 figs. and 1 coloured plate).—As an ornamental vegetable, this *Chenopodium* is to be recommended. The young leaves of the terminal shoots and lateral branches are bright purple. It can either be left bushy or used as a border plant by pinching off the tall shoots, and it may be cooked and eaten like spinach.

F. A. W.

Chinch Bug, The (*Blissus leucopterus*, Say.) By F. M. Webster (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 113; Nov. 13, 1909; 8 figs.).—The chinch bug is an insect which does immense damage to crops of wheat, barley, rye, and corn in North America and the sugar-cane in Mexico; it is also known to attack many species of grasses.

The pest first made its appearance in the wheatfields of North Carolina about the year 1785; there were similar destructive outbreaks in 1809, 1839, and 1840. The estimated loss due to it in the thirty-eight years from 1850 to 1887 was the enormous sum of $267,000,000.

Remedial and preventive measures are discussed in this bulletin, also the life-history and habits of the insect.—*V. G. J.*

Chrysanthemums, List of Best Varieties (*Le Jard.*, vol. xxiv. No. 556, p. 118; April 20, 1910).—In publishing its annual list of the best varieties of chrysanthemums, the *Soc. Nat. de Hort. de France* has this year added to the name of the producer and date of production the colour of each variety.—*F. A. W.*

Clover (Red), The Constituents of the Flowers of. By Fred B. Power and A. H. Salway (*Jour. Chem. Soc.*, vol. xcvii., Feb. 1910, pp. 231-254).—This is a report upon the first complete investigation of the constituents of these flowers, which were collected for the purpose from a cultivated crop in Kent. The flowers only were gathered. These yielded a light yellow essential oil with a rather unpleasant odour, which was found to contain furfuraldehyde. They also isolated several new phenolic substances, two of which were named by the authors as pratol and pratensol respectively, as well as three new glucosides, which they have named trifolin, trifolitin, and iso-trifolitin, and a new dihydric alcohol which they name trifolianol. There was also found a coumaric acid, salicyclic acid, and various fatty acids.—*W. A. V.*

Clover Root-borer, The (*Hylastinus obscurus*, Marsham). By F. M. Webster (*U.S.A. Dep. Agr., Bur. Entom., Cir.* 119; March 23, 1910; 4 figs.).—The adult insect is a small, dark brown, hard-bodied beetle; the female deposits her eggs in the crown of the plant between the middles of May and June. The larvæ hatch out in about a week and burrow downwards into the root, and become fully grown and in the pupal state by the beginning of August. They are all fully developed beetles by October, but they do not attempt to leave the plant until spring.

In Europe they are known to attack Scotch broom and yellow-flowered rest-harrow, as well as red clover and lucerne.

The only effective preventive measure yet discovered is summer fallowing as soon as the hay crop is removed; at this time the young are in an immature state, and if deprived of food must perish.—*V. G. J.*

Clover-root Curculio, The (*Sitones hispidulus*, Fab.) By V. L. Wildermuth (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 85, part iii., March 7, 1910; 5 figs. and bibliography).—The genus *Sitones* includes a large number of species, many of which are known to be more or less injurious to leguminous crops. *Sitones puncticollis* Steph. and *S. lineatus* L., frequently called "pea weevils," have been especially destructive at times to peas, beans, and clover in England, as well as on the Continent. Miss Ormerod (1883-4, 1893) stated that the larvæ were sometimes known as "white maggots" and that in England they obtained their living from the roots of the plants attacked, while the adults feed on the leaves.—*V. G. J.*

Clover, Selection of. By S. M. Bain and S. H. Essary (*U.S.A. Exp. Stn: Tennessee, Bull.* 75; 1906).—A fungus pest (*Colletotrichum trifolii*) has done great damage in this State, so much so that in many parts the crop has been almost entirely abandoned. It also attacks lucerne. Although by August-September most of the plants had died, healthy plants were discovered here and there. These plants were selected and their seed preserved. Next year this selected seed was sown in rows alternating with rows of a commercial clover of average character. The plots were all artificially infected by the diseased crop of the previous season.

About 95 per cent. of the selected plants survived, and only some 5 per cent. of those not selected. Alsike clover is immune to this disease.—*G. F. S.-E.*

Codlin Moth in the Ozarks. By E. L. Jeune (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 80; pt. 1; 1909).—In 1907 experiments as to remedial measures against the codlin moth were conducted by the Bureau of Entomology, and in 1908 experiments relating to its life-history were undertaken. The latter show that in this district three generations of the moth are produced yearly, the third brood generally surviving the winter and producing the first spring brood of the following year.—*C. H. L.*

Codlin Moth. By E. Dwight Sanderson (*U.S.A. Exp. Stn. New Hampshire, Bull.* 143; Dec. 1909; 23 figs.).—The loss to New Hampshire fruit-growers through this pest is estimated at fully one-third of the total crop, equivalent to a cash loss of $250,000 per annum. This bulletin goes very fully into its life-history, with special reference to the dates of pupation, the emergence of the moths, and the hatching of the eggs. Statistics compiled from careful examination showed that about 70 per cent. of the cocoons were on the main trunks of the trees, and that only 5 to 20 per cent. survived the New England winter, the time of pupation varying according to the season (p. 64). It is estimated that less than 5 per cent. of the first brood of larvæ transform to the second generation of moths, but, as each female lays from 60 to 70 eggs, it follows that 4 per cent. only of this first brood, assuming half to be males, would be sufficient to ensure as many larvæ in the second generation as in the first (p. 71).

Experiments in spraying have been conducted for three years, over a million 'Baldwin' apples, on 521 trees, in 102 plots, being examined and recorded. When used alone arsenate of lead was found better than Paris green, on account of its superior adhesiveness (p. 72), but when used with Bordeaux there was little to choose. Two pounds of arsenate of lead to 50 gallons of water gave the best results. It was found that a single spraying just after the blossoms fell prevented 82 per cent. of the worminess of the season (p. 75), and that when this was supplemented by a second spraying about July 1 this percentage rose to 85-95, giving not over 5 per cent., and often less than 1 per cent. of the picked fruit wormy, while the later spraying alone prevented only 70 per cent. of the worminess. Much depends upon the varieties of apples treated, the calyces of 'Baldwin's' closing a week to ten days after the last blossoms have dropped, while in other varieties the calyces remain open longer. The bulletin closes with a sample of replies to a series of questions with which fruit-growers were circularized, and a number of reports on the effects of spraying. For other investigations dealing with this pest see abstract in the last number of the JOURNAL, p. 233.—*A. P.*

Colorado, Vegetation in. By W. W. Robbins (*Bot. Gaz.* vol. xlix. pp. 256-280; with 7 figs.; April 1910).—The physiography, climatology, and plant zones of Colorado are described.

The zones are divided into: (1) *Plains*, with grasses dominant and an open flora (sometimes not more than 25 per cent. of the ground is covered); on ridges and "buttes" occur shrubs, such as *Yucca*, *Prunus*, *Ceanothus*, and various mat and rosette plants. *Populus* and *Salix* spp. fringe the streams. (2) *Eastern lower Foothills and Meras*, the meeting-place of forest and grass formations. The dominant trees are Douglas fir (*Picea mucronata*) and Rocky Mountain yellow pine. Scrub Oak and *Cercocarpus parvifolius* form a "chaparral" between grass and forest. *Pinus edulis* and *Sabina* spp. are common in the lower regions. (3) *Eastern Upper Foothills*, from 6000 to 8000 feet. Yellow

Pine and Douglas fir forest. "South Park" is xerophytic. (4) *Montane Zone*, 8000-10,000 feet. *Pinus contorta* var. *Murrayana* dominant, with *P. aristata*, *P. flexilis*, *Picea Parryana*, and *Abies lasiocarpa*. *Populus tremuloides* is dominant in some places with oak shrubbery. (5) *Sub-Alpine Zone*, 10,000 feet to timber line. Engelmann Spruce dominant, with *Salix*, *Betula*, *Ribes*, and *Vaccinium*; average height of timber line, 11,500 feet. (6) *Alpine Zone*, grasses and low alpine matforms. Amongst these are several British alpines (*Silene acaulis*, *Deschampsia caespitosa*, *Phleum alpinum*, &c.). (7) San Luis valley, chiefly *Artemisia tridentata* with *Chrysothamnus*, *Atriplex*, &c. Conifers occur on the slopes. (8) *Middle Park* has a similar vegetation. (9) *Western Sage Plains and Lower Foothills*. Sage brush, *Pinus edulis*, Scrub Oak, and Rocky Mountain yellow pine. The Coniferae are found up to 7500 feet on hills. The sage plains stretch from the streams to the hills. Alkaline flats are covered with Chenopodiaceae. Oak chaparral often forms a distinct zone between *P. edulis* and the montane zone. Below 8000 feet the climatic and zonal relations are quite different on the eastern and western slopes of the Rocky Mountains respectively.—*G. F. S.-E.*

Compositae, Ray-florets of. By H. Nakano (*Bot. Gaz.* vol. xlix. pp. 371-378; with 4 figs.; May 1910).—The author has examined the variation in number of ray and disc florets of Aster *fastigiatus*. He finds that there is one mode which does not belong to the Fibonacci series. There is a distinct seasonal change in the number of rays. The classes in individual variation appear to be almost continuous. The coefficient of correlation between the ray and disc florets was found to be 0·3219 ± 0·0111.—*G. F. S.-E.*

Cotton, Egyptian, Experiments with, in 1908. By T. H. Kearney and W. A. Peterson (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 29; 1909).—These experiments showed, among other results, that acclimatized seed was better than newly imported, and that cross-fertilization, with corresponding deterioration, was inevitable if upland cotton was grown anywhere in the vicinity of Egyptian cotton.

The development of the branches which bear the bolls was found to be largely influenced by the time of planting and the way in which irrigation was managed. The planting should be as early as possible, and irrigation sufficient, especially in the later stages of growth, to prevent a check to the plant through undue wilting and slow recovery in hot weather. Given careful cultivation on not too large a scale, and co-operation between farmers, in order to market an even sample, there is no reason why an excellent quality of Egyptian cotton should not be produced in Arizona.—*C. H. L.*

Cotton in the West Indies (*West Indian Bull.* vol. x. No. 2. pp. 153-167; 1909).—Some of the West Indian islands show an increase in the acreage under cotton cultivation, in others the sugar-cane remains

paramount, but, taken altogether, the quality of cotton produced is good and finds a ready sale in the English market. This is especially the case with St. Vincent cotton, which fetched several pence per lb. more than cotton grown in other islands.—*C. H. L.*

Cotton Seed, Effect of Storage on. By H. A. Tempany (*West Indian Bull.* vol. x. No. 2, pp. 121-124, 1909).—Storage alters the chemical composition of the seed. It also deteriorates its germinating power.—*C. H. L.*

Cucumber Beetle, The Striped (*Diabrotica vittata* Fab.). By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 31; May 1909; 2 figs.).—A revised edition of previous circulars dealing with the life-history, food-plants, and methods of prevention and destruction of this pest.—*V. G. J.*

Cytology, Toxic Solutions and. By W. W. Stockberger (*Bot. Gaz.* vol. xlix. pp. 401-429; with 7 text figs.; June 1910).—The author has examined the effect of toxic solutions on mitosis. In this respect distilled water seems to be itself a toxic solution. The osmotic action of the solution used may produce abnormal results. Neither copper sulphate, nor phenol, nor strychnine produced amitosis or binucleated cells. The spindle fibres and achromatic structures are most sensitive to toxic solutions. The author did not see the large fusion nuclei of Nemec, nor did he find that doubling of the nucleolus preceded amitosis (Wasielewski).—*G. F. S.-E.*

Dahlias, Cactus and Pompon (*Gard. Chron.* xlvii. (1910), p. 52; Jan. 22).—A descriptive list of the best of the newer Cactus and Pompon Dahlias is given. A distinction is made between those that are good for exhibition and those that are useful for garden decoration.—*F. J. C.*

Davidia involucrata. By S. Mottet (*Le Jard.*, vol. xxiv. No. 552, p. 52; Feb. 20, 1910).—The first flowering of this remarkable tree was described in *Le Jardin*, 1906, No. 466, p. 216. Since that time it has flowered regularly each year, and last October it was laden with over a hundred fruits. Their character confirms the previous conclusion that it belongs to the family *Cornaceae*.—*F. A. W.*

Deutzia and Philadelphus, New Varieties. By C. Arranger (*Le Jard.*, vol. xxiv., No. 550 p. 24; Jan. 20, 1910; with 2 figs.).—*Deutzia crenata magnifica*, hybrid from *D. crenata*, by fertilization of var. *candidissima plena* with *D. Vilmorinae*. Absolutely hardy, free growing, shoots bronze-green. Very free bloomer, with masses of large full flowers, like minute roses, with pure white, regular petals. *D. discolor elegantissima*, produced by crossing *D. scabra* with *D. discolor purpurascens*. An elegant plant, with long brown shoots, axillary inflorescence in corymbs of fifteen to eighteen flowers, which are white and pink, with pink buds. Flowers for a long time, the later blooms being bright rose-coloured.

Among the new hybrids of Philadelphus are: 'Avalanche,' 'Bouquet blanc,' 'Conquête,' *erectus*, 'Fantaisie,' *fimbriatus*, 'Gerbe de Neige,' 'Manteau d'hermine,' 'Mer de glace,' 'Mont-Blanc,' 'Nuée blanche,' 'Pavillon blanc,' *purpureo-maculatus*, 'Rosace,' 'Virginal.'—*F. A. W.*

Dionaea, Closing of Leaves of. By W. H. Brown and L. W. Sharp (*Bot. Gaz.* vol. xlix. pp. 290-302; April 1910).—The authors find that it is the intensity rather than the number of stimuli which induce closing. The number of stimuli required varies in the inverse order of their intensity. Response is brought about by the compression of the cells, not only of those at the base of the hairs, but also of other cells of the leaf-blade. Contact with a hard object, continued pressure, or release of pressure does not produce closing.

Water at the temperature of the room only causes closure when it bends a sensitive hair. In other respects their experiments seem to confirm those of Macfarlane and others.—*G. F. S.-E.*

Disease-resistant Plants, Development of. By G. M. Reed (*II. Ann. Rep. Missouri State Bd. of Hort.*, 1908, p. 284).—Relates successful experiments in selecting for seed parents disease-resisting specimens, and raising hybrids, one parent being disease-resistant, and attributes resistance to chemical rather than anatomical differences in plants.—*E. A. B.*

Drop Watering (*Le Jard.*, vol. xxiii., No. 543, p. 302; Oct. 5, 1909).—A new method of watering has been invented by Dr. A. Koren, which is explained at length in the *Annales de la Direction de l'Hydraulique et les améliorations agricoles*. It is said to increase production in fruit gardens to the extent of 650 per cent. The water is led from the reservoir to the garden by a long conduit at a certain height above the ground, whence it is distributed to zinc receivers 4 metres long and 0·75 m. wide, perforated like a rose and placed on each side the conduit. These receivers run on wheels, and can be moved from one place to another. They are fed by means of zinc funnels with rubber tubes, which are dropped into the conduit near the receivers. The watering then takes place mechanically. When one part is sufficiently irrigated, the gardener rolls the apparatus on to the next, with no need for personal supervision. The holes of the rose contain little balls which prevent the water from flowing out in too heavy a jet, to the injury of the germinating seeds and seedlings. This method further has the advantage of warming the water, which is exposed to sun and air in the conduit receivers, and has been found to rise from 15° to 30° C. in its passage from source to soil under these conditions. A movable gutter of perforated zinc connected with the rain-water tank would roughly give the same results.—*F. A. W.*

Economic Plants, Distribution of, from W.I. Botanic Stations (*West Indian Bull.* vol. x. No. 2, pp. 146-152; 1909).—The West

Indian botanic stations send out cuttings, seeds, and grafted plants, and have materially assisted the development of the agriculture of the islands.

In addition to this they have been useful in purchasing seed for sale at cost price to planters and peasants and in exchanging desirable varieties of plants from one island to another.

In St. Lucia there has been an increasing demand for coffee; in Montserrat for bay trees, in Antigua for limes and cocoa-nuts and forest trees. In St. Vincent the demand for permanent types of economic plants was less than formerly, though still considerable. The decline can be clearly traced to the extension of the sea island cotton industry.

C. H. L.

Eelworms. By T. W. Kirk and A. H. Cockayne (*Dep. Agr. New Zealand, Bull.* 20; illus.; 1909).—Eelworms and their eggs possess remarkable vitality, for they can survive three or more years of desiccation. They attack many kinds of plants, including potatos, wheat, oats, hops, clover, and onions.

Methods of control are extremely difficult, but the following are useful:—

1. Rotation of crops, extending to six or even eight years' interval between the same species.
2. Infested refuse should be destroyed.
3. Deep ploughing.
4. Kainit and sulphate of potash have been found to check the increase of eelworms.
5. A trap crop of beet which can be destroyed before the pest has bred and escaped again into the soil.—*C. H. L.*

Elm-leaf Beetle, The Imported (*Galerucella luteola* Müll.). By C. L. Marlatt (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 8, revised Sept. 22, 1908; 1 fig.).—This insect is easily subjected to treatment in nearly every stage of its life-history. The best means of extermination consists of spraying the foliage with Paris green.—*V. G. J.*

Enzymes. By Dr. F. G. Kohl (*Beih. Bot. Cent.* xxv. 1. Abt. Heft ii. pp. 115-126; 1910).—Details are given of certain important experiments which seem to show that the enzyme, katalase, when acting upon grape-sugar produces lactic acid. Oxalic acid may also be formed by change of the lactic acid through the action of some oxidizing ferment, possibly the katalase.

This important paper is apparently the last by this distinguished authority on ferments and fermentation, for his death is recorded in this volume.—*G. F. S.-E.*

Euonymus Scale, The (*Chionaspis euonymi*, Comstock). By J. G. Sanders, M.A. (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 114; Nov. 24, 1909; 2 figs.).—The most serious enemy of the various species and varieties of *Euonymus* in the Eastern United States is commonly

known as the Euonymus scale. The injuries occasioned by the attacks of this pest almost preclude the growing of these beautiful plants for hedges and borders.

The author gives an account of the history and habits of the pest, and recommends spraying with kerosene emulsion.—*V. G. J.*

Farmers' Institutes in America. By W. H. Beal and John Hamilton (*U.S.A. Dept. Agr. Off. Exp. Stns. Bull.* 213; 1909).—Those who are interested in agriculture or in education (or in both) should consult this pamphlet, which gives a good sketch of the enormous amount of work carried on by such institutions in America. There is nothing in this country which corresponds exactly with these farmers' institutes. They are undoubtedly of great use in the United States.—*G. F. S.-E.*

Fern Hybrids. By W. D. Hoyt (*Bot. Gaz.* vol. xlix. pp. 340-370; with 12 figs.; May 1910).—The author endeavoured to obtain hybrids by using several different species, but was unsuccessful. The sperms always entered the archegonia in every species. When they were of the same species thirty-seven fusions occurred in ninety-seven cases, but when of different species not one fusion occurred, although 129 archegonia were entered.

There is a long description in this paper of the movements of sperms, which were found to be complex and varied. They are directed by a series of gradual swingings of their anterior ends, accompanied by a rotation on their axes. They do not suddenly turn towards or away from the stimulant. The stimulant affects the organism as a whole, and does not act on local parts of it. The reactions of fern sperms seem to be of the same kind as those described for protozoa.

G. F. S.-E.

Fern Prothallia. By L. Pace (*Bot. Gaz.* vol. 1. pp. 49-58; with 11 figs.; July 1910).—Describes some peculiar prothallia kept for three years in the laboratory. About 300 archegonia have been found on one of them. Apogamy occurred.—*G. F. S.-E.*

Field Experiments, Essentials of Successful. By C. E. Thorne (*U.S.A. Exp. Stn. Ohio, Circ.* 96; with illustrations; 1909).—The Director of this station gives some very necessary information as to the many essential points which have to be kept in view for successful field experiments.—*G. F. S.-E.*

Fodder Grasses, South-West African. By R. Pilger (*Nat. König. Bot. Berlin*, No. 46, pp. 133-155, February 1910; with 12 figs.).—In this paper the principal grasses of South-West Africa are described. Their morphological characters are given, and the distribution of each species and its significance as a fodder plant for cattle, sheep, etc., is referred to. Good text-figures, showing the characters of the most important species of these grasses, accompany the descriptions.—*R. B.*

Frost Injury (*Gard. Chron.* xlvii. (1910), p. 24; Jan. 8).—The cause of injury to plants exposed to low temperatures is discussed, and the bearing upon the question of the drying of protoplasm owing to the withdrawal of water without the power of keeping up the necessary supplies.—*F. J. C.*

Frost, Resistance of Plants to (*Gard. Chron.* xlvii. (1910), p. 120).—The means by which certain plants are able to resist low temperatures which are fatal to others are discussed, and it is pointed out that these means are mainly due to the presence of certain chemical substances in the cells of the plant which delay freezing. The presence of these substances is not marked by any definite morphological characters, so that it remains as difficult as ever to foretell whether or not a plant is likely to suffer from frost by a mere inspection of it.—*F. J. C.*

Fruits and Seeds, Anatomy of. By Dr. Georg Ritter (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft i. pp. 132-156; 1909).—The anatomical characters of a considerable number of the fruits and seeds of such natural orders as Caryophyllaceae, Ranunculaceae, Saxifragaceae, Crassulaceae, Cruciferae, and a few others are given in tabular form. It might, in some cases, be possible to find the natural order or even the species by this method.—*G. F. S.-E.*

Fruit (Deciduous) Insects and Insecticides (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 68; Jy. 20, 1909; figs.; bibliography).—Nine papers by various authors, profusely illustrated, and of great interest to fruit-growers generally. These papers were issued separately during the years 1907-1909, and are headed, respectively, "The Pear Thrips," "The Spring Canker-worm," "The Trumpet Leaf-miner of the Apple," "The Lesser Peach Borer," "The Lesser Apple Worm," "Grape Root-worm Investigations in 1907," "Demonstration Spraying for Codlin Moth," "The Grape-leaf Skeletonizer," and "The Peach-tree Bark Beetle."—*V. G. J.*

Fruit Flies. By T. W. Kirk, F.L.S. (*Dep. Agr. New Zealand, Bull.* 22; 1909).—The Queensland fruit-fly (*Tephrites Tryonii*) attacks apricots, peaches, plums, &c., the egg being laid beneath the skin, whence spraying is useless. The best remedy is to gather up all infested fruit and cook or destroy it, also to cultivate under the trees and encourage birds and poultry to pick up the grubs. Many of the Australian States have stringent regulations as to imported fruit and plants, but still more might be done by legislation.

The West Australian or Mediterranean fruit-fly (*Halterophora capitata*, also known as *Ceralitis capitata*) is already established in Queensland, West Australia, New South Wales, Tasmania, and South Africa, and every effort should be made to keep it out of New Zealand, as it attacks practically every kind of fruit, and is most difficult to contend against.

It is very similar to the Olive-fly (*Dacus Oleae*), for which poisoned

bait has been used successfully in Italy. The following mixture may be sprayed on the trees before the eggs are laid: 1 lb. arsenate of lead, 25 gallons of water, 5 gallons of treacle.—*C. H. L.*

Fruit-growing for Home Use. By H. P. Gould (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 51; March 1910; 5 figs.).—The central and southern plains of the United States are a semi-arid region, the rainfall varying from 12 to 20 inches a year, and the shade temperature from −30° F., or less, to 100° F., or more (p. 7). It is recognized by the authorities that, in the rapid settlement which is taking place in this area, owing to the improved methods of dry-farming now in vogue, the matter of home building is a very important feature, and a good supply of fruit a very material element in the well-being of the family. Surplus fruit always sells well in these parts, buyers sometimes driving forty or fifty miles across the plains to obtain it (p. 15). The peculiar obstacles which these great plains offer to fruit-growing are severe hail-storms, late spring frosts, and the ever-present difficulty of insufficient rainfall, the most important point in the production of all crops, fruit included, being the conservation of moisture. In an area so vast, however, the conditions will not be uniformly bad. Those living in it, or intending to do so, will find valuable information in this circular about fruit-growing as it has to adapt itself to the peculiar conditions of soil and climate.—*A. P.*

Fruit-growing in Wisconsin (*U.S.A. Hort. Soc., Wisconsin, Bull.* 17; 4 plates).—The object of this bulletin is to correct what the authors call the erroneous notion that conditions in this State are not well adapted for fruit-growing. Those early settlers who first planted fruit trees seem to have had a disastrous experience, partly through planting wrong varieties, partly through that neglect which is the common portion of orchards regarded as mere adjuncts to farms, and partly through choosing the open prairie, where there was no original tree growth, trees accustomed to more or less sheltered conditions, or at least to a broken or rolling country, not succeeding in such positions.

The yield of apples in Wisconsin in 1909 was estimated at 250,000 barrels. Statistics are given, based on concrete cases, showing the cost of planting an orchard and bringing it to a productive stage, with the subsequent annual cost of maintenance and gross value of produce.

A. P.

Fruits in Wisconsin, Common Insect Pests of. By J. G. Moore (*U.S.A. Exp. Stn. Wisconsin, Bull.* 190, Feb. 1910; 32 figs.).—The bulletin describes each insect in the form in which it does its damage, together with the character of the injury, so that the pest may be easily identified and treated accordingly. The pests dealt with are the scale insects and insects affecting the apple, plum, cherry, and small fruits.—*V. G. J.*

Fruit Trees: Protection from Gnawing Animals. By F. H. Ballou (*U.S.A. Exp. Stn. Ohio, Bull.* 208; Aug. 1909; 20 figs.).—

The area under fruit trees in Ohio in 1907 is put at 266,340 acres, including small home orchards, and the annual loss from the depredations of rodents (rabbits, mice, and wood chucks or ground hogs) is estimated at $200,000. This bulletin is mainly taken up with the description of various methods of protection more or less familiar to fruit-growers, and the saving of young trees which have been girdled by the method known as bridge-grafting. Mice are said to injure trees very rarely, unless there is grass or littery matter at the base of the stem to provide a hiding-place.—*A. P.*

Fungus Diseases of Economic Importance, Some (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 171).

I.—*Miscellaneous Diseases.*—(*a*) New disease of witches' broom on bamboo (*Phyllostachys*), caused by *Loculistroma bambusae*. The general appearance of the disease is that of witches' broom formation. No actual fasciation takes place, but the internodes are shortened and the branches take on a plume-like appearance. Sclerotium-like bodies originate at the nodes, and are generally sessile, and under one centimetre in length. Perithecia and conidia have also been observed.

(*b*) *Botrytis* on paeonies.—*Botrytis paeoniae* (Oudeman) or *Sclerotinia paeoniae* (Massee) is reported as being introduced in paeonies from many different parts of the world, and causing considerable loss. Spraying with fungicides during the *Botrytis* stage is recommended, and satisfactory results have been obtained by dressing the soil with lime at the rate of 500 to 2000 lb. to the acre, the quantity depending upon the acidity of the soil.

(*c*) Cyclamen disease.—A variety of *Glomerella rufimaculans*, causing spots on the leaves. Conidial stage known as *Colletotrichum*.

(*d*) *Stemphylium citri* on lemons.

II.—*Pineapple rot caused by Thielaviopsis paradoxa*, and the effect of formaldehyde as a fungicide and disinfectant. Formaldehyde gas generated by treating potassium permanganate with formalin (40 per cent. strength) in certain quantities proved very effectual in controlling the growth of *T. paradoxa*. The pineapples were placed in a fumigating-box, and different quantities of the ingredients used under different temperatures and for different lengths of time.

The quantity of gas fatal to the fungus was generated from 1200 to 1300 cubic centimetres of formalin per 1000 cubic feet of space under temperatures varying from 65° F. to 80° F. for not less than thirty minutes. Both forms of spores were killed by this means, and the fruit not materially affected. The odour of formalin is stated to be soon dissipated after fumigation.—*D. M. C.*

Galls of Java, Contributions to the Knowledge of. Part II. By W. and J. Docters van Leeuwen-Reijnvaan (*Ann. Jard. Bot. Buit.* vol. viii. series ii. pp. 119-183, 1910; with 8 plates).—In this interesting article three galls caused by the attack of mites upon Javanese plants are described in detail. The first gall described is one upon

Cinnamomum zeylanicum. It occurs chiefly upon the under surface of the leaves, but occasionally upon the upper leaf surface or upon the branches. Infection of the leaf by the mite (*Eriophyes Dieteri* Nal. in this case) takes place in the bud. The first result of the infection is that the epidermal cells in the immediate neighbourhood of the mite grow out into hairs, or become more elongated in shape. A little later a ring of leaf-tissue which surrounds the mite begins to grow rapidly, so that it builds up a kind of wall around the mite. The further growth of this wall of tissue produces the gall which encloses the mite within it. The cavity of the gall is at first simple, but subsequently becomes divided up into a number of secondary chambers. The growth of the partitions which produce this subdivision of the gall-cavity is due to the stimulus of the young mites derived from the single one originally enclosed. In older galls the cavity is filled with hairs. The cytological changes in the wall-cells of the gall due to the stimulus of infection are described.

The second gall dealt with is one on the leaves of *Ipomoea Batatas* produced by the attack of an undetermined mite.

This gall belongs to the class of "pocket galls," that is to say, it is formed not by the growth of a wall of tissue around the mite, but by the leaf surface becoming pushed in where the mite rests, so that it produces a tiny pocket at this spot. The histological and cytological features of the mature and developing gall are fully described. This gall is distinguished from most others caused by mites by the complete absence of hairs in its interior and by its more complete histological differentiation.

The third gall dealt with is also due to an undetermined mite attacking the leaves of a fern (*Nephrolepis biserrata*). The development of this gall is somewhat similar to that upon *Cinnamomum*. In both cases the gall is formed by the growth of a circular wall of leaf-tissue, which grows round and gradually encloses the mite. In the case of *Nephrolepis*, however, a thickening of the leaf-tissue precedes the development of the ring-wall. No clear cytological alterations in the affected cells could be found in this case.

The latter part of the paper is occupied with a most interesting discussion of some general questions raised by the study of these galls. The classification of galls by other authors and the definition of the word "gall" is touched upon. The relative share taken by the plant and the animal in the production of galls is indicated. The authors point out that the character of the gall is in the first place determined by the animal, "the plants only furnish the material from which the animals select, and again build up what they require for the construction of their dwelling."

The plant tissues possess the potentiality of developing in several directions according to the dictates of external conditions. In the case of gall formation, the stimulus of the infecting organism, so to speak, switches the tissues off the normal course of development and brings to light other, usually latent, qualities of the cells.—*R. B.*

Germination of Seeds. By J. Aymard (*Le Jard.* vol. xxiv. No. 557, p. 139; May 5, 1910).—Good results can be obtained by the use of chloride of lime, 4 grammes to a litre of water. After steeping in this mixture at 20° C. for ten hours, some old seeds of *Viola cornuta* which had failed to germinate in two sowings came up in a proportion of over 60 per cent.—*F. A. W.*

Graft-Hybrids. By L. Daniel (*Le Jard.* vol. xxiv. No. 551, p. 38; Feb. 5, 1910).—In 1884 a whitethorn was grafted on several of its branches with a medlar of the thornless and large-fruited variety. After coming to maturity and bearing, these grafted medlars began to die off from the top, while the stock sent up shoots of pure hawthorn from its base. In 1902 one of the grafts produced a shoot which branched in succeeding years in the three following forms. After growing as a single stem for about 10 cm., it divided into (1) a branch of pure whitehorn like the shoots at the base of the stalk; (2) a branch of wild medlar, with hybrid fruits resembling partly medlars, partly the common haw; (3) another hybrid branch, more like hawthorn than medlar. Two years later another shoot appeared at the same graft, on the opposite side, which resembled wild medlar.—*F. A. W.*

Greenhouse Thrips, The (*Heliothrips haemorrhoidalis*). By H. M. Russell (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. vi.; Aug. 1909; 3 figs.).—This species was first described by Bouché, in 1833, as *Thrips haemorrhoidalis*, from specimens taken in a greenhouse in Europe. At that time the author believed the native land of the species to be America. That this supposition was correct appears evident at the present time.

The *Thrips* attack a large variety of ornamental plants and feed on the leaves; in many cases the larvæ secrete themselves under a slight web made by red spiders.

A number of remedies for the treatment of the pest are suggested, among them being fumigation with (1) nicotine, (2) hydrocyanic acid gas, and spraying with nicotine liquids and kerosene emulsion.

V. G. J.

Guatemala, &c., New Plants from. By J. D. Smith (*Bot. Gaz.* vol. xlix. pp. 453-458; June 1910).—Describes new species of *Anona, Krameria, Calliandra, Caesaria, Reynoldsia, Bouvardia, Tonduzia, Marsdenia, Heliotropium,* and *Blechnum.*—*G. F. S.-E.*

Gum-tree Scale. By T. W. Kirk, F.L.S., and A. H. Cockayne (*Dep. Agr. New Zealand, Bull.* 13; illus.; 1909).—About 1900 the plantations of blue gum at Timaru, which are invaluable to the farmers as providing their chief supply of wood, began to be infested by a scale (*Eriococcus coriaceus*) to such an extent that trees 40 to 80 feet tall were being rapidly destroyed, besides which the pest spread in a short time to all plantations within a ten-mile radius. The Government entomologist of New South Wales was asked to send successive

shipments of the ladybird, *Rhizobius ventralis*, which is known to feed on the scale.

By 1907 strong colonies had been established in the affected districts, and the work accomplished by them has been little short of marvellous. They have almost completely subdued the scale, which at one time threatened the destruction of the blue gum, and at the present time both plants and seed of the latter are in as great demand as before the infestation.—*C. H. L.*

Hardiness, Relation of Early Maturity to, in Trees. By R. A. Emerson (*Ann. Rep. Missouri State Bd. of Hort.* 1908, p. 152; with 6 figs.).—Points out instances of this correlation and advantages of seed from northern-grown trees over southern.—*E. A. B.*

Heligoland, Garden Plants in. By Dr. P. Kuckuck (*Bot. Zeit.* 1. Abt. Heft iii. & iv. pp. 49-86; with 2 figs. and 3 plates; April 15, 1910).—This gives a very complete account of the meteorology and climate of Heligoland. It is much warmer in winter than other parts of Germany. There is a good rainfall, plenty of sunshine in summer, but the winds are strong, and storms are very common. The winter is more severe than that of Brighton. The author's research garden is described at some length. It contains an alpinum, a water basin, sandy heaps for dune plants, &c.

Neither Scots Pine, Firs, nor Silver Fir succeed in the island. *Pinus montana* and *P. Mughus* are being tried.

All except some six of his *Pinus insignis* seedlings were killed by the hard frosts in winter; *Cupressus macrocarpa*, *Callitris Gunnii*, and *Sequoia gigantea* also died.

Other plants which have not succeeded in Heligoland are *Butomus*, *Arundinaria*, *Chamaerops humilis*, *Washingtonia*, *Pontederia*, *Cordyline*, *Dracaena Draco*, *Musa japonica*, *Quercus Ilex*, *Q. glaucus*, *Zelkova*, *Kadsura*, Camphor, *Philadelphus*, *Pittosporum heterophyllum*, *Stranvaesia*, Cherry laurel, *Skimmia*, *Mallotus*, *Camellia*, *Cistus laurifolius*, *Elaeagnus pungens*, Myrtle, *Gunnera*, *Kalmia*, *Arbutus*, *Phillyrea*, *Osmanthus*, most Veronicas, *Viburnum*, *Olearia*, and *Cynara Scolymus*.

The following are growing, but not doing satisfactorily, viz. *Buchloe* (Buffalo grass), *Arum italicum*, *Agave applanatus*, Birch, edible Chestnut, *Escallonia*, *Wistaria*, Rhododendrons.

The following, on the other hand, seem to be doing well, and are quite satisfactory: *Typha*, *Eulalia*, *Yucca filamentosa*, *Montbretia*, Walnut, Willows, Poplars, *Quercus sessiliflora* (grown from an acorn found in a pigeon's crop), *Morus*, Fig (fruits), *Mesembryanthemum* (one species), *Nymphaea*, *Anemone coronaria*, *Akebia*, Poppies, Hydrangea, *Saxifraga*, *Sedum*, *Pittosporum Tobira*, Roses (excellent, 5000 plants in one garden), *Rubus deliciosus*, *Fragaria chiloensis*, *Ailanthus*, *Euonymus japonicus*, *Opuntia Rafinesqui*, *Daphne Mezereum*, *Hippophae*, *Fuchsia*, *Aralia mandschurica*, *Aucuba*, Ash, Lilac, *Forsythia*, *Ligustrum*, *Salvia splendens*, *Tecoma*, one sp. (New Zealand) of *Veronica*, *Centranthus*, and *Artemisia rupestris*.—*G. F. S.-E.*

Hot Water as an Insecticide. By G. Boillet (*Le Jard.*, vol. xxiii., No. 548, p. 380; Dec. 20, 1909).—All aphides and caterpillars are killed by immersion in water heated to 45° C., and beetles and other insects invested with a chitinous covering perish in water of 50° C., whereas plants will survive immersion up to 54° C. Nothing, accordingly, is simpler when pot plants are attacked by insects than to roll the pot in a cloth so that the soil does not drop out, then plunge it into water at 50° C. and shake it in the water for half a minute. On trees, again, the insects may be destroyed by applying hot water with a paint-brush or by spraying the trees, and in the latter case it must be remembered that the water loses heat in passing through the air, so that if the jet is two yards off the tree the water should be at 55°, if four to six yards off, at 60° to 65°, and so on. In view of the highly deleterious nature of many insecticides, it seems as though the method might be practised with advantage. The only difficulty is the exact regulation of the temperature, which, however, can be easily surmounted.

F. A. W.

Hymenomycetes (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft ii. pp. 205-225; 1910).—M. Britzelmayr (Augsburg), gives a revision of his diagnoses of *Boletus*, *Polyporus*, &c., as far as *Typhula* and *Tremella*.

G. F. S.-E.

Indian Corn, Breeding of. By Louie H. Smith (*U.S.A. Exp. Stn. Illinois, Bull.* 128; 1908).—The author records the results of the selection experiments carried on at this station from 1897 to 1906.

The paper is of very great importance to all breeders of plants, and is of great interest also in the theory of heredity. A large number of experiments were made in carefully selected plots and every precaution was taken against accidental crossing.

The intention was to produce by continuous selection four races of Indian corn, characterized by (1) a high percentage of protein (therefore more valuable as feeding stuff), (2) a low percentage of protein (for manufacturers of glucose, gum, &c.), (3) a high percentage of oil (commercially valuable), (4) a low percentage of oil (important for swine-feeding).

As regards (1) the high protein race, the author began (in 1896) by selecting individual seeds with a high percentage of protein (12·54 per cent.) from a crop averaging 10·92 per cent. protein.

In 1906 the seed selected had a percentage 16·30, and the average of the crop had risen to 14·26 per cent. of protein. The average had therefore been raised from 10·92 to 14·26. In the tables recorded at the end of the volume we notice that individual seeds were found with even 17·67 per cent. protein.

In race (2), bred for a low percentage of protein, the results are almost equally striking. Beginning in 1897 with seeds of 8·96 per cent., selected from a crop averaging 10·92 per cent., the seeds in 1906 had

only 7·21 per cent., and the crop average was 8·64. Seeds with as low a percentage as 7·04 occur in the tables.

As regards the high oil race (3) the selected seeds had 5·39 per cent. (crop average 4·70), and by 1906 the selected seeds had risen to a percentage of 7·86, whilst the crop averaged 7·37 per cent. Seeds with 8·59 per cent. of oil occur in the tables.

So also with the low oil race (4), the 1896 seeds had a percentage of 4·03 (crop 4·70), but in 1906 the average of the crop was 2·66 per cent., and the seeds sown had only 2·20 per cent. In one case recorded in the tables the oil percentage amounted to only 1·60 per cent.

It will be seen, therefore, that in individual cases the two protein races had diverged enormously—17·67 per cent., as compared with 7·04 per cent. So also as regards the oil races. Seeds with 8·59 per cent. occurred in the high oil, and with 1·60 per cent. in the low oil strain. As regards the averages the result has been in all cases satisfactory.

In order to eliminate the effects of soil, climate, and cultivation, mixed protein and mixed oil plots were arranged, in which seeds of the different races were grown on the same "hill." The results showed that both protein and oil contents are influenced directly by the seed sown.

Other experiments have been carried out (5 years) to test differences in ash content of stem, leaf, and grain in these four strains. It was found that there was slightly more ash in the high protein and high oil grains as compared respectively with the low protein and low oil races.

The amount of protein in the upper stalk and leaves is always higher in the high protein race. The high oil strain has more protein in the grain. The phosphorus contents are also higher in both plant and grain of the high protein race, and in the grain only of the high oil race. The difference in oil contents between the high and low protein races was very slight at first (4·52, as compared with 4·35), but in 1906 the high protein had 5·28 per cent. oil and the low protein only 3·86 per cent.

As regards the average yields of the crops the results in 1906 were as follows: Illinois high protein gave 65·1 bushels of shelled corn to the acre. Low protein yielded 73·2; high oil, 66·3; and low oil, 83·2. Two unselected standard varieties yielded ("Silvermine") 75·7 and (Leaming) 87·9 bushels to the acre.

Throughout the four years the yields of these races seem to have been, as a rule, lower than those of the best standard varieties. Yet, as regards the amount of protein produced per acre, 65·1 bushels at 14·26 per cent. protein means 520 pounds of protein to the acre, which is a higher yield than the "Silvermine," of which 75·7 bushels will only give 463 pounds to the acre.

In-breeding may have had some effect in diminishing the yield, for each of these four varieties is descended from at most three ears. The "high protein" race is descended from a single ear.

Formation of high protein percentage depends also on the supply of nitrogen, and the amount can be increased by the use of appropriate fertilizers.

The tables at the end of the report give the percentages of some hundred or more individuals of each of the four races, and for every year from 1897 to 1906. They appear to be of great value for the study of heredity by biometrical methods.—*G. F. S.-E.*

Insect Depredations in North American Forests and Practical Methods of Prevention and Control. By A. D. Hopkins, Ph.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 58, part v.; Dec. 4, 1909).—There is conclusive evidence that insects have been in the past, and are now, important factors in the waste and reduction of timber supplies, and will continue to be such in the future (pp. 57-58).

They attack perfectly healthy trees and kill them (pp. 58). They reduce the value of living timber and that of both crude and finished products (pp. 60-66).

The results of extensive investigations and of practical applications during recent years have demonstrated that some of the most destructive insect enemies of American forests can be controlled and serious damage prevented with little or no ultimate cost over that involved in good forest management and business methods.—*V. G. J.*

Insecticides and Fungicides. By A. B. Cordley (*U.S.A. Exp. Stn., Oregon, Bull.* 108; April, 1910).—Formulæ and brief directions for the preparation of sprays for various agricultural and domestic purposes.—*V. G. J.*

Insects Injurious to Truck Crops. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 82, part ii.; Nov. 30, 1909; 6 figs.).—In this bulletin the author describes the life-history, food-plants, distribution and means of prevention and extermination of (1) the parsnip leaf miner, (2) the parsley stalk weevil, and (3) the celery caterpillar.—*V. G. J.*

Irrigation in Wyoming, Farming without. By J. D. Tomar (*U.S.A. Exp. Stn. Wyoming, Bull.* 80; March 1909).—A thoroughly practical account of the precautions necessary and methods which should be followed in "dry land farming" in this State is given. There is a careful description of the meteorological conditions and climate of Wyoming. Letters from many farmers who have experimented with the dry method are included. Crops have been grown with a rainfall of less than ten inches.—*G. F. S.-E.*

Juniper, Fertilization of (*Beih. Bot. Cent.* xxv. 1. Abt. Heft ii. pp. 201-241; with 4 figs. and 10 plates; 1910).—Mr. Nichols (Yale University) has examined *Juniperus communis* var. *depressa*.

Pollination occurs about May 25, and fertilization occupies some 12½ months. There is a full description of the cytology of the archesporium, of the formation of microspores and megaspores, of the

tapetum and archegonia (8 to 10), and of the development of the proembryo.—*G. F. S.-E.*

Laeliocattleya × 'Madame H. Martinet.' By Ch. Maron (*Le Jard.*, vol. xxiv. No. 555, p. 104; April 5, 1910. Coloured plate).—This fine hybrid has large deep rose flowers, with a wide labellum, undulated and fringed at the edges, with purplish streaks, and a yellow ground at the throat. It was obtained from *C. Vigeriana* (from *C. labiata* var. *flammea* × *C. aurea*) and *Laeliocattleya* × 'Mrs. Leeman' (from *Laelia Digbyana* × *Cattleya aurea*).—*F. A. W.*

Landscape, Our Duty to. By M. O. Nelson (*Ann. Rep. Wisconsin State Hort. Soc.* 1909, vol. xxxix. p. 182).—A plea for the preservation of the natural beauties of the country, if for no higher reason, yet because "landscape is a tangible, taxable, marketable asset."—*E. A. B.*

Larch (*Larix europaea*). By Gifford Pinchot (*U.S.A. Dep. Agr. Forest Service, Circ.* 70; revised August 6, 1909).—When grown in good soil the wood of the larch is yellowish-white, but in cold, elevated situations it is reddish-brown and much harder. It is much used for shipbuilding, poles, posts, cross-ties, &c.

On low ground it is often attacked by a fungus known as *Trametes pini*, which so destroys the substance of the wood that the tree breaks down in even a very slight wind.

The circular describes the methods of propagation, planting, and cultivation practised in the United States.—*V. G. J.*

Lead Arsenate (*U.S.A. Dep. Agr., Bur. Chemistry, Bull.* 131).—A detailed report of extensive experiments on:

(i.) Composition of lead arsenates found on the market;

(ii.) "Home-made" lead arsenate and the chemicals entering into its manufacture;

(iii.) Action of lead arsenate on foliage.

The composition of lead arsenate found on the market proved, on analysis, to be very variable. The diverse results reported from all parts as to the scorching powers and efficiency of lead arsenates as insecticides are in a great measure due to the varying quantities of the ingredients used and the larger or smaller percentage of impurities present.

The use of "home-made" lead arsenate is recommended, as the purity of the chemicals used and the methods of preparation greatly influence the scorching produced by the spray. Lead arsenate can be prepared both from lead acetate and lead nitrate; the latter is preferred by the author as being slightly more poisonous and as remaining in suspension longer. The difference in cost of the two compounds is immaterial.

The best formula was found to be

A.	Sodium arsenate (65 per cent. strength) .	8 oz.
	Lead acetate (sugar of lead) . . .	22 oz.

B.	Sodium arsenate (65 per cent.) . . .	8 oz.
	Lead nitrate	18 oz.

Each salt must be dissolved separately in one to two gallons of water, and the lead salt added to the sodium salt, until there is a slight excess of lead. The test for this excess of lead (a slight and not a large excess being essential) is to dip potassium iodide paper into the mixture. Excess of lead turns potassium iodide paper bright yellow. It is necessary to mix the ingredients well and dilute to 25 gallons of water. Wooden vessels should be used.

Peach leaves burn very readily with lead arsenate, especially if the lead arsenate is of inferior quality.

Atmospheric conditions after spraying greatly influence the effect of the spray mixture on the leaves. The final results of extensive experiments to ascertain the exact relation between scorching and atmospheric conditions have not yet been arrived at.

The author has proved by experiment that the carbon dioxide of the atmosphere has little or no solvent action on the lead arsenate. When the spray was applied with spring water containing various salts there was an increase in scorching over the lead arsenate applied with distilled water.

Distilled water with 10 grains of sodium chloride caused serious damage, while after three applications of the spray with distilled water plus 10 grains of sodium carbonate peach trees were entirely defoliated.

Lime added to the spray in the proportion of 4 lb. to 50 gallons almost entirely prevented injury to the foliage. Lead arsenate does not affect apple trees to any great extent.—*D. M. C.*

Leaves, Shapes of. By Prof. A. Hansgirg (*Beih. Bot. Cent.* xxv. 1. Abt. Heft ii. pp. 137-182; 1910).—This is a condensed and revised summary of the author's classification of leaf shapes. This system depends upon the function or use of the leaf, and is given in full in his well-known work "Phyllobiologie."

It is impossible even to attempt to further condense the descriptions of his fifty-five main types of leaf, especially as most of these main types include several sub-types.

In addition to the forms of the mature leaf Professor Hansgirg briefly summarizes the adaptive characters of immature leaves, such as cotyledons, and of various embryonal or "youth forms."

He concludes that the leaves of every species of water, marsh, and land plant are always in harmony with the outside factors which work on them, especially with climatic influences, with the chemical and physical constitution of the soil and with the moisture conditions.

In most, perhaps in all plant species, there is a prevalent tendency to attain the greatest possible performance (or capacity for performance) by the least possible expenditure of matter and energy.

In dealing with the extraordinary similarity in leaf structure often observed in species of widely different affinity he shows that this can be best explained by direct special adaptation to the particular environment—that is, to restricted climatic or other influences.

Changes in the state, organization, and shape of the leaf may be called out by specific inheritable rudiments and individual variations (in part "phytopsychic").

He seems to consider the original type of leaf as simple, sessile, and entire, either with one median vascular bundle or with several separate free-ending nerves.

More differentiated types arose by gradual phyletic variation and direct progressive adaptation (in part self-regulated). These, after many generations, may have now become quite constant characters, having been fixed by inheritance (that is, by the phylogenetic reproduction of all the life processes of the mother-being). The above translations of Professor Hansgirg's conclusions must be taken "without prejudice." No definition is given of the expression "phytopsychic."—*G. F. S.-E.*

Legume Inoculation. By Karl F. Kellerman (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 63; May 28, 1910).—A description of the soil-transfer and pure-culture methods of inoculation.

The Bureau of Plant Industry is carrying on field experiments to determine, if possible, what soil conditions are most favourable for the successful inoculation of leguminous crops by the use of pure cultures, and also to determine under what conditions it is useless to attempt to inoculate certain legumes without some radical change in the method of fertilizing or cultivating these fields.—*V. G. J.*

Legumes, Native, in Nebraska and Kansas. By J. A. Warren (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 31; 1909).—To determine the importance of native legumes in fixing nitrogen, notes as to number and distribution were made in certain spots chosen at random. They were found to be least abundant on good soils that bore heavy crops of grass, having a better chance on poor soils, where the grass was thin. In number they came next to grasses and composites, but on all soils and in all climates of the region legumes peculiarly adapted to the conditions were present in large numbers.

Among others *Psoralea*, *Kuhnistera*, *Amorpha*, and *Astragalus* were the most important.

The conclusions arrived at in Nebraska were confirmed by similar but independent investigations in Maryland.—*C. H. L.*

Leopard Moth. By L. O. Howard and F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Ent., Circ.* 109; 1909).—America owes to Europe the destructive *Zeuzera pyrina*, whose larvæ do such damage to almost all shade and ornamental trees. The grubs burrow and tunnel deeply into the heart or pith of the trees, so weakening the branch that during storm it is sure to break off.

Woodpeckers feed on the larvæ, and sparrows, in cities, sometimes destroy the eggs, while the moths are caught in large numbers in electric arc lamps. Bisulphide of carbon can be injected into their

holes and burrows (a teaspoonful to each, with a glass syringe), which are then stopped up, and a careful look-out should be kept for the borer, as much in worthless trees as in those that are valuable.

C. H. L.

Lima Bean Pod-borer, The, and Yellow-necked Flea-Beetle, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 82 part iii.; Dec. 28, 1909; 1 fig.).—An interesting account of (1) the Lima-bean pod-borer (*Etiella zinckenella* Treit.), which is the larva of a gray-and-white moth with ochreous scales on the fore-wings, for which no method of control has yet been discovered, and (2) the yellow-necked flea-beetle (*Disonycha mellicollis* Say.), which attacks the leaves of beet, and the spinach flea-beetle (*D. xanthomelaena* Dalm.). Spraying with arsenicals seems to be the only remedy for these pests.—*V. G. J.*

Lime-sulphur, Concentrated: Its Properties, Preparation, and Use. By John P. Stewart (*U.S.A. Exp. Stn. Pa., Bull.* 92; July 1909; 5 figs.; 6 tables).—A description of the advantages and disadvantages of concentrated lime-sulphur. Its principal shortcomings being: extreme causticity to flesh, corrosion to machinery, large amounts of sediment of uncertain value, necessity for immediate application, and its bad keeping qualities. The author has made a careful study of the matter, with a view to reducing some of the present difficulties.—*V. G. J.*

Lime-sulphur Mixtures. By W. M. Scott (*U.S.A. Dep. Agr., Bur. Pl. Ind. Circ.* 27; April 1909; 2 figs.).—This paper is a report of the second season's experiments with lime-sulphur preparations for summer spraying, together with additional experiments with other sulphur compounds. The work was carried out more thoroughly than before on both the peach and the apple and extended to include the cherry. The experiments resulted in some modifications in the method of making the mixtures for the peach and for Japanese plums, but on the whole they were very encouraging for further experiments, and for widespread use in the orchard where Bordeaux mixture is found objectionable (see JOURNAL R.H.S., vol. xxxiv. p. 129).

V. G. J.

Lime-sulphur, Preparation and Use of Concentrated. By John P. Stewart (*U.S.A. Exp. Stn. Penn., Bull.* 99; May 1910; 3 figs.).—According to the author the art of spraying is in a state of transition, involving the breaking away from Bordeaux mixture and the whole list of copper sprays which have served as fungicides for more than a quarter of a century, and the substitution of what may become an equal list of sulphur sprays. Among the latter, the clear, concentrated lime-sulphur solution will undoubtedly occupy a leading place.

In the commercial form and the new concentrated home-preparation

it has an excellent record, both as an insecticide and fungicide, being first used by Cordley of the Oregon station in 1907.

Details of preparation are given, and a table showing the best times and strengths of application for the various insects and diseases for which the spray is used.—*V. G. J.*

Lime-sulphur Sprays. By W. M. Scott (*U.S.A. Dep. Agr., Bur. Pl. Ind. Bull.* 188; March 1910; 8 figs.).—The russet effect so common on apples sprayed with Bordeaux mixture results from a slight burning of the young fruits caused by the early sprayings.

The application made as soon as the petals fall, and the one three weeks later, are chiefly responsible for this injury, the older fruit being more resistant. As the young fruit grows the injured portions of the skin become larger, resulting in russet blotches and streaks, which greatly mar the appearance and market value of the mature fruit.

The foliage is also injuriously affected by applications of Bordeaux mixture. It produces spots similar to the leaf-spot, and Bordeaux injury is often mistaken for leaf-spot disease.

Experiments conducted by the writer in Virginia during 1909 indicate that the Virginian apple-growers may largely substitute lime-sulphur preparations for Bordeaux mixture with satisfactory results.

This paper contains an account of these experiments together with general directions for the treatment of apple diseases in Virginia.

V. G. J.

Lime-sulphur Wash, A Chemical Study of. By L. L. Van Slyke, C. C. Hedges, A. W. Bosworth, and P. J. Parrott (*U.S.A. Exp. Stn., Bull.* 319 and 320, Dec., 1909).—These bulletins describe the composition of various commercial preparations, and the influence of conditions of preparation upon the composition of lime-sulphur.

V. G. J.

Maize, Diplodia Disease of. By F. D. Heald, E. M. Wilcox, and Venus W. Pool (*U.S.A. Exp. Stn. Nebraska*, 22*nd Ann. Rep.* pp. 1-22; with 21 figs.; 1909).—This paper gives a very complete account of the life history and parasitism, and of the synonomy, symptoms, and cultural characteristics of the fungus *Diplodia Zeae*, which causes a very serious "dryrot" of the ear of Indian corn.

G. F. S.-E.

Maple Worm, The Green-striped. By L. O. Howard and F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Ent., Circ.* 110; 1909).—*Anisota rubicunda*, together with the fall webworm and tussock moth caterpillar, defoliates maples of all kinds, besides other shade trees. There are two or three generations a year. Many birds (but not the English sparrow) feed on the caterpillars, and arsenical spraying is effective if used as directed in *Farmer's Bull.* 99 and when the caterpillars are young. Individual choice trees must be protected by hand-picking the eggs and moths.—*C. H. L.*

Mendelism: Colour Inheritance in Beans. By R. A. Emerson (*U.S.A. Exp. Stn. Nebraska*, 22*nd Ann. Rep.* pp. 67-101; with 2 figs.; 1909).—The paper describes experiments in crossing varieties of the common bean (*Phaseolus vulgaris*) in order to determine whether there are any definite principles controlling inheritance of colour. The presence of pigment was always found to be dominant. Totally pigmented individuals, when crossed with partially pigmented, resulted in (F 1) all totally pigmented, (F 2) 64 totally and 30 partially pigmented. In F 3 the numbers were 236 (totally) and 107 (partially). Crosses of partially pigmented and white beans gave in F 1 12 totally pigmented; in F 2 14 totally, 10 partially, and 16 not pigmented. Ten white-seeded plants in F 2 produced 50 plants, all with white seeds.

Crosses of mottled and self-coloured beans gave in the first generation all mottled; in the second generation, 331 mottled and 124 self-coloured. Self-coloured crossed with white beans gave in first generation 65 mottled and 1 self-coloured (4 self-coloured considered to be accidental); in the second generation there were 113 mottled, 52 self-coloured, and 70 white.

Mottled beans crossed with white were, in first generation, all mottled; in second generation, 115 mottled, 2 self-coloured, and 41 white.

There is a full discussion of possible theories which might explain these results, and which will be of great interest to Mendelians.

G. F. S.-E.

Molasses, Observations on. By H. A. Tempany (*West Indian Bull.* vol. x. No. 2, pp. 130-142; 1909).—Molasses, when kept, undergoes two changes—frothing and souring—both due to fermentation.

Frothing is not caused by the action of organisms, but by the decomposition of gummy substances (glucinates) formed by the action of lime and glucose, which break down with evolution of gas.

As to souring, which is due to organisms, it would seem that vacuum-pan molasses, though prepared under more scientific conditions, has a greater tendency to ferment than that obtained by the muscovado process. It is possible that there are present in the latter obscure bodies exercising an inhibitive influence.—*C. H. L.*

Monstrosities, Horticultural. By R. Rouhaud, P. Parry, and E. Gadeceau (*Le Jard.*, vol. xxiv., No. 552, p. 56; Feb. 20, 1910, with 4 figs.).

1. *Syncarpous Apples.* These result from the development of twin flowers upon a single peduncle. Though rare in apples, this is not seldom the case in the *Amygdalaceae*. Certain plums exhibit this teratological variation almost every year.

2. *Abnormal Kaki fruits.* The fruit of *Diospyros Kaki* is freely eaten in Japan, the principal varieties being *costata* and *Mazeli*. The latter ripens in France, and has a pleasant flavour of apricot. The abnormal fruits figured in the article exhibit mesocarpal horn-shaped

expansions. This is due not to disjunction of the carpels, as might be supposed, but to what Dr. Masters termed *cration*, resulting from excessive development of supplementary lobes or excrescences from different organs. Owing to cration of the carpels, spurs, horns, &c., arise on the surface of the ovary during its development, as is frequently seen in oranges.—*F. A. W.*

Moonlight, Action of, on Colour of Flowers (*Le Jard.*, vol. xxiii. No. 541, p. 267; Sept. 5, 1909).—According to the *Revue des Sciences*, an interesting series of experiments has recently been made on tea roses, with the object of determining whether the rays of the moon may not have some effect upon the complex and little understood phenomena that govern the coloration of flowers. A number of rose-trees on the point of flowering were divided into three lots, one being left as a control in the open border, another being kept in total darkness day and night, and a third shaded during the day and exposed each night to the action of moonlight. At the end of a month the plants of lot 2 were etiolated, the few flowers upon the branches having a sickly aspect, pale and ashen yellow in colour, with lighter streaks. The flowers of lot 3 were most delicate in colouring and far finer than those of the control plants. No conclusions are put forward, but the experiments are still in progress.—*F. A. W.*

Nevada, Reclamation of Desert Land in. By Carl S. Scofield and Shober T. Rogers (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 157; August 1909).—The paper describes what has been done at the Truckee Carson Experiment Farm in order to help settlers in this part of the State. The rainfall is about 2·5 inches per annum. The land is irrigated, and it consists of two distinct types, viz. a sandy soil and the hard "clay flats." It is in natural condition, covered mostly by *Artemisia, Sarcobatus, and Chrysothamnus*. Windbreaks are very necessary. The first crops are usually grain, alfalfa, and vegetables. The greatest difficulty is found with the hard clay land, which bakes and cracks when it dries up after irrigation. Small plants are killed by this process. Disc harrows, corrugated rollers, and steel-toothed weeders are used to keep the surface in good condition.

Good crops of beet with high sugar contents may be expected; also potatos, wheat, oats, and barley are recommended.

Perhaps the most interesting part of the paper is that dealing with the "alkali" lands and the manner in which these are affected by irrigation.—*G. F. S.-E.*

Nitrate, Movement of, in the Soil. By Robert Stewart and J. E. Greaves (*U.S.A. Exp. Stn. Utah, Bull.* 106; Dec. 1909).—The average (three years') amounts of nitric nitrogen (per acre) in the soil were found to be as follows:—

Spring Period.—Indian corn, 142 lb.; potato land, 98 lb.; alfalfa land, 27 lb.; fallow land, 165 lb. per acre.

During Irrigating Period.—Indian corn, 144 lb., and after irrigation 104 lb.; potato lands, 110 lb. before and 94 lb. after irrigation; alfalfa, 34 lb. and 38 lb.; fallow, 174 lb. before and 130 lb. after irrigation.

During the Fall.—Indian corn, 63 lb.; alfalfa, 32 lb.; fallow, 151 lb.

The nitric nitrogen tends to accumulate in the lower foot sections (depths of 7 to 10 feet) during winter and spring. The concentration is low on alfalfa land. Cultivation seems to increase nitric nitrogen contents, but only temporarily.

The concentration decreases steadily from period to period in potato and Indian corn land, but is nearly constant in alfalfa and fallow lands. Under oats the nitric nitrogen disappears rapidly during the last few weeks of growth.—*G. F. S.-E.*

Nitrogen Cycle and Soil Organisms. By S. F. Ashby (*Bull. Dep. Agr. Jamaica*, vol. i. 1909, p. 2; 4 figs.).—A clear statement of the present knowledge of nitrogen fixing and separating organisms in the soil of Jamaica.—*E. A. B.*

Nitrogen, Electric Fixation of Atmospheric. By S. C. Stuntz (*U.S.A. Dep. Agr., Bur. of Soils, Bull.* 63).—This bulletin gives a brief description of the manufacture and uses of the two new nitrogenous fertilizers, basic calcium nitrate and calcium cyanamide, and a very complete and valuable list of references to literature dealing with these substances, including a list of articles giving the results of manurial trials with them.—*F. J. C.*

Nutritive Salts, Ratio of Absorption of. By O. Schreiner and J. J. Skinner (*Bot. Gaz.* vol. l. pp. 1-30; with 9 figs.; July 1910).—These experiments were carried out with wheat seedlings grown on perforated sheets of hard rubber or aluminium discs and kept floating (by means of cork floats) on water.

No fewer than sixty-six different solutions were used, consisting of calcium acid phosphate, sodium nitrate, and potassium sulphate in various proportions. An ingenious graphic method of remembering the various proportions is explained in the paper. It consists roughly in putting the three salts used at the corners of an equilateral triangle. Each side of the triangle is divided into ten equal parts. Lines are then drawn parallel to the sides through the points. The original points and the intersections of these lines are numbered. The numbers correspond to the strengths of all possible combinations of the three salts, which differ by 10 per cent.

The results showed that the best growths occurred with solutions containing between respectively 10 to 30 per cent. potash, 30 to 60 per cent. nitrate, and 30 to 60 per cent. potash.

The seedling plant requires high amounts of potash and low of phosphate.—*G. F. S.-E.*

Nymphaea Lotus. By F. Henkel (*Gard. Chron.* xlvii. (1910), p. 83; Feb. 5; fig.).—Seeds were received by the author from the

Northern Territory of Australia, and when plants flowered they proved to resemble those from India and Africa. The flowers are white, with yellow anthers on white filaments. The dentate leaves are dark green with irregular dark blotches.—*F. J. C.*

Oats, The Blade Blight of: a Bacterial Disease. By J. F. Marms, (*U.S.A. Agr. Exp. Stn. Ohio, Bull.* 210; Oct. 1909).—An abnormal condition of the oat crop due to the above disease seems to have attracted attention in 1890, when it threatened to destroy the entire crop of oats in the Eastern and Central States. Between that date and now the trouble has been attributed by different investigators to a variety of causes, such as thrips, grain louse (*Macrosiphum granaria*), fungus (*Fusicladium destruens*) inclement, cold, damp springs followed by hot dry weather, &c.

After extensive experiments the writer of this bulletin discovered that the blight was due to two species of bacteria, *Pseudomonas avenae*, a white organism, and *Bacillus avenae*, a yellow organism living in symbiotic relationship.

Inoculation with either organism singly produced limited or no results, whereas when both organisms were combined they gave rise to the typical oat blight. Infection takes place mainly through the stomata, rarely through the roots. The organism is present in the soil and gets splashed on to the leaves during heavy rains. In the early stages spots appear on the leaves. These spots gradually extend until the entire leaves turn first yellow or red, and finally brown, when they collapse altogether.

The crop is affected either by direct infection of the heads by the organisms or indirectly through the general weakening of the whole plant through damage to the leaves. Very frequently the main shoot alone grows and develops, thus making the crop very thin, and splashing during rain is, in consequence, considerable.

Cold, damp weather is very conducive to the rapid development and spread of the disease.

Infection can also be carried by aphides and other plant lice. Inoculations with organisms found inside live aphides gave rise to typical blight. The blight is not only pathogenic to oats, but also to certain forms of wheat, barley, maize, timothy grass, *Poa pratensis*, *P. compressa*, and others. The only remedy suggested by the author is the breeding and selection of resistant strains.

Sixteen plates are given to illustrate the various stages of the disease, the damage done, and the microscopic and macroscopic characteristics of the two organisms under investigation.—*D. M. C.*

Orchard Practice in Ohio. By F. H. Ballou (*U.S.A. Exp. Stn. Ohio, Circ.* 94; April 1909; 29 figs.).—This is the first report of the new Division of Horticultural Inspection in this State, and is mainly occupied with the study of horticultural conditions, possibilities, and requirements in different parts of this large area. The writer favours

the method adopted in some districts of the severe and persistent heading down of standard fruit trees, to facilitate orchard operations (pp. 7-15). Pear blight has been very disastrous in the past, but growers are obtaining a considerable degree of success against it, the main factors in their treatment apparently being thorough lime-sulphur sprayings, combined with the complete removal, with sterilized tools, of all diseased parts, while soil cultivation has been discontinued (p. 17). This latter part appeals to the author, as he is a strong advocate of the grass-mulch method of orchard practice, especially in hilly districts (p. 18). Various other subjects of more or less interest to those concerned in the horticultural development of the State are touched upon —e.g. orchard renewal (p. 11), the retail market (pp. 34-38), and potato-growing in the Huson valley (pp. 44-50). The report closes with instances of bud-sporting in apples and grapes, and the selection of plants showing special power of resistance to disease.—*A. P.*

Orchard Practice in Wisconsin (*U.S.A. Hort. Soc. Wisconsin, Bull.* 18; 7 figs.).—This bulletin has been prepared for the purpose of answering inquiries relative to fruit-growing in this State, and is a small but comprehensive treatise, intended, as it says, for beginners.

A. P.

Orchards: Protection from Spring Frosts by Fires and Smudges. By P. J. O'Gara (*U.S.A. Dep. Agr., Farmers' Bull.* 401; June 1910, 11 figs.).—This bulletin deals with experiments and methods employed in preventing frost injury by means of fires and smudges in some apple, pear, and peach orchards in Southern Oregon in the spring of 1909. The writer claims that as a result many acres of crops, valued at $500 to $1000 the acre, were saved at a total expenditure of $15 to $20 the acre. The materials to employ for fuel and the manner of distributing them in the orchards, the methods of preparing and starting the fires, together with the necessity of understanding local weather conditions, so as to know when to set the fires going, are discussed at considerable length.—*A. P.*

Orchard Soils, The Treatment of (*West Indian Bull.* vol. x. No. 2, pp. 170-179; 1909).—The orchards under consideration are chiefly cacao, and in their early stages cassava, yams, and sweet potatos are grown under the trees. When the latter have grown too much for this to be possible the best treatment of the soil to avoid caking or impoverishment from pasturing or hoeing is to let the weeds grow to a certain height, and then to cut them down with a cutlass and leave them on the surface. This provides a mulch, which prevents undue evaporation, adds to the supply of humus in the soil, and lessens washing away by heavy rains.

The character of the "weeds" might be controlled to a certain extent with the object of increasing leguminous varieties.—*C. H. L.*

Orchard, The Farmer's. By C. G. Woodbury (*U.S.A. Exp. Stn. Purdue, Circ.* 17; Sept. 1909; 36 figs.).—The farmstead orchards

in Indiana appear to be in a similar condition to those in England, the author attributing the fact that a large proportion of them fail to justify their existence to neglect resulting from a lack of a definite knowledge as to how present conditions can be cheaply remedied. This circular is intended to impart the necessary knowledge, and deals fully with the planting of young orchards and the renovation of old ones, with directions for the general treatment of both. The writer maintains that there is a proper place for such home orcharding as well as for the more strictly commercial aspects of horticulture, and that the encouragement and development of the former is one of the most important problems to be solved in connection with the development of the horticultural resources of the State.—*A. P.*

Orchids, New Varieties, 1909. By M. Honny (*Le Jard.*, vol. xxiv., No. 550, p. 22; Jan. 20, 1910).—The new varieties cited, with descriptive notes, are: *Cattleya Gaskelliana alba* var. *Germinyensis*; *C. Hardyana alba* 'Madame Octave Doin'; *C. labiata alba* var. *Gilmouriae*; *C. labiata* var. 'Phénomène'; *Cypripedium* × 'Abel Chatenay'; *C.* × *Marguerito-citrinum*; *C.* × 'Souvenir de Louis Cappe'; *Dendrobium Bronckartii*; *Habenaria* × Regnier; *Laeliocattleya* × 'Espérance'; *L.-c.* × 'Mme. Eug. Boullet'; *L.-c.* × 'M. Adrien Chaussé'; *L.-c* × Watteau; *Lycaste Skinneri* var. *hellemensis*; *Odontioda Bradshawi*; *O. Charlesworthii*; *O. crispum* 'Gloire d'Helemmes.'—*F. A. W.*

Orchid Portraits.—The following new and rare Orchids have been figured recently:—

Bulbophyllum virescens . .	*Bot. Mag.* t. 8327.
*Cattleya × 'Artemis' . .	*Journ. Hort.* 1910, ii. p. 123.
C. intermedia Aquinii . .	*Gard. Mag.* 1910, p. 413.
*C. Lawrenceana var. 'Mary-Regina'	*Gard. Mag.* 1910, p. 431; *Journ. Hort.* 1909, i. p. 555; *Orch. Rev.* 1910, p. 201.
*C. Mendelii var. 'Stuart Low'.	*Gard. Chron.* 1910, ii. p. 34, fig. 13; *Gard. Mag.* 1910, p. 574.
*C. O'Brieniana alba . .	*Journ. Hort.* 1910, ii. p. 75.
C. Warscewiczii alba . .	*Gard. Chron.* 1910, ii. p. 51; *Orch. Rev.* 1910, p, 232.
*C. Warscewiczii, Low's var. .	*Journ. Hort.* 1910, ii. p. 171.
*C. Warscewiczii 'Othello' .	*Gard. Mag.* 1910, p. 617.
Cirrhopetalum biflorum . .	*Bot. Mag.* t. 8321.
Coelogyne Lawrenceana . .	*Gard. Chron.* 1910, i. p. 335, fig. 143.
Cymbidium × eburneo-Lowianum	*Gard. Chron.* i. p. 406, fig. 185.
C. insigne	*Bot. Mag.* t. 8312.
Cypripedium callosum Sanderae	*Journ. Hort.* 1910, ii. p. 51.

C. pubescens	*Gard. Chron.* 1910, i. p. 369, fig. 163.
C. spectabile	*Gard. Chron.* 1910, i. p. 370, fig. 164.
C. × 'Vidor'	*Journ. Hort.* 1910, ii. p. 99.
Disa grandiflora	*Gard. Mag.* 1910, p. 657.
Eria rhyncostyloides	*Gard. Chron.* 1910, i. p. 378, fig. 167.
Laelia × 'Bella'	*Orch. Rev.* 1910, p. 265.
Laeliocattleya × Dietrichiana	*Rev. Hort. Belge*, 1910, p. 133.
*Miltonia Bleuana, Hessle var.	*Journ. Hort.* 1910, i. p. 437; *Gard. Mag.* 1910, p. 393; *Garden*, 1910, i. p. 277.
M. Bleuana nobilior	*Trib. Hort.* 1910, p. 99.
M. Bleuana var. 'Queen Mary'	*Gard. Chron.* 1910, i. p. 351, fig. 151.
*M. × 'Memoria Baron Schröder'	*Gard. Chron.* 1910, i. p. 355, fig. 155.
M. vexillaria × Odontioda Vuylstekeae	*Rev. Hort. Belge*, 1910, p. 150.
*M. vexillaria var. 'Snowflake'	*Journ. Hort.* 1910, i. p. 531.
M. vexillaria var. virginalis	*Gard. Mag.* 1910, p. 591.
*Odontioda × 'King George V.'	*Gard. Chron.* 1910, i. p. 349, fig. 150; *Journ. Hort.* 1910, i. p. 507.
*O. × 'St. Fuscien' var. 'Imperator'	*Gard. Mag.* 1910, p. 457.
*O. Vuylstekeae × ?	*Rev. Hort. Belge*, 1910, p. 150.
Odontoglossum amabile	*Rev. Hort. Belge*, 1910, p. 150.
*O. ardentissimum var. 'Herbert Goodson'	*Journ. Hort.* 1910, i. p. 461.
*O. crispum 'Magnum Bonum'	*Gard. Mag.* 1910, p. 392.
O. maculatissimum	*Rev. Hort. Belge*, 1910, p. 150.
*O. × 'Memoria King Edward VII.'	*Gard. Chron.* 1910, i. p. 353, fig. 153; *Gard. Mag.* 1910, p. 427.
O. Rossianae var. rubens	*Journ. Hort.* 1910, i. p. 413; *Garden*, 1910, i. p. 238.
O. Vuylstekeae	*Rev. Hort. Belge*, 1910, p. 150.
*Pescatorea lamellosa	*Journ. Hort.* 1910, ii. p. 147.
*Vanda coerulea, Westonbirt var.	*Gard. Mag.* 1910, p. 667.
V. suavis pallida, Clifton's var.	*Gard. Chron.* 1910, i. p. 298.

* A painted portrait of those having an asterisk prefixed is preserved in the Royal Horticultural Society's collection.

Peach Brown-rot and Scab, The Control of. By W. M. Scott and T. Willard Ayres (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 174;

Mch. 5, 1910; 1 fig., 4 plates).—Brown-rot affects the fruit of the peach, causing it to decay on the trees or *en route* to market. It is due to the fungus *Sclerotinia fructigena* (Pers.) Schröt. which is often called *Monilia*, the name given to the summer stage of the fungus before the perfect form was known.

This fungus has for years been recognized as the most destructive disease of stone fruits; it also attacks the apple, pear, and quince, but in a lesser degree. It occurs in Great Britain, Germany, France, Austria, and Belgium.

Peach scab, or black-spot, is caused by the fungus *Cladosporium carpophilum* Thüm. This disease spoils the appearance of the fruit, and the large cracks which occur in severe cases open the way for brown-rot.

The bulletin describes experiments in spraying and gives a summary of the season's work (from 1907 to 1909 inclusive), with recommendations for the treatment of orchards.—*V. G. J.*

Peach Fruit Spot, Spraying for. By A. B. Cordley and C. C. Cate (*U.S.A. Exp. Stn. Oregon, Bull.* 106, Aug. 1909; 8 figs.).—The results so far obtained indicate that one of the most important steps in controlling this disease is to spray in fall with some good fungicide.

A more extended account will be published when the work has been completed, but a brief note is given so that growers may know what has already been accomplished and thus be prepared to spray at the proper time.—*V. G. J.*

Peach Varieties in Oklahoma. By O. M. Morris (*U.S.A. Exp. Stn. Oklahoma, 18th Report*, pp. 93-98; 1908-1909).—Seedling trees are more hardy and live longer than budded trees, but the quality, size, and quantity of fruit is more satisfactory in budded trees. The weather conditions are discussed, and full notes given as to the behaviour of some 40 varieties tested.—*G. F. S.-E.*

Pear-leaf Blister Mite (*Phytoptus pyri*). By Pierre Passy (*La Pom. Franc.; July* 1910; pp. 212-220).—These mites in autumn hide among the scales of the buds and in the crevices of the bark and clefts of the small branches. Towards spring they pierce the small leaves of the buds and enter the parenchyma of the leaf, moving freely in the empty spaces formed in the thickness of the leaf. Soon they lay their eggs, the young larvæ grow quickly, absorbing the juice of the leaf, the mites quit the leaves and go to the extremities of the young shoots and pierce the small unexpanded leaves. There are, therefore, at least two invasions yearly, those of spring and autumn. In spring nearly all the leaves of the same bud are attacked, numerous blotches being distributed all over the leaves. In the autumn fewer leaves of the same bud are attacked, and in these the blotches are chiefly along two parallel lines. At this autumn attack the larva of the fly *Cecidomyia pyri* is also often at work preventing the expansion of the terminal leaves. On the approach of the fall of the leaf the *Phytoptus*

goes to the bud-scale, and there passes the winter. Of preventives, dusting with flowers of sulphur causes the foliage to be scorched, and picking off the attacked leaves is a long process and interferes with the nourishment of the tree. Of other remedies to destroy the mites on the bark, applied during winter after the leaf has fallen, the following may be mentioned:—

1. Equal parts creosote, lime, and water, stir and apply with a brush.

2. Alcohol 1 litre, soft soap 1 kilo, stir the soap in the alcohol till perfectly mixed, add 12 litres water, and paint or spray.

3. Alcohol ½ litre, corrosive sublimate 1 gramme, water ½ litre, paint or spray with care to the person spraying.

4. Petroleum 9 kilos, fish oil 2 kilos, carbonate of soda 1 kilo, add water to make 100 litres, stir well to make it milky, this can be used with the spray-pump.

5. Lime and sulphur spray is valuable as a paint or spray, having the additional advantage of being a fungicide; even brushing the trees with plain water destroys a number of these parasites.

During summer hydrocyanic acid gas is an effective insecticide, though somewhat difficult to manage, and needs careful management or it may be dangerous to the operator; the method is described. Mr. Lenglet, in *La Pom. Franc.*, 1910, June, pp. 172-174, has found carbolineum emulsion, applied in spring before buds open, valuable, destroying a great quantity of other insects as well, cleansing the bark in a wonderful way, the moss and lichen loosening at once with the contact of the brush. The cost of the mixture is small, it is made by dissolving 2 kilos of soft soap in 4 litres of boiling water, mix little by little 1 kilo of carbolineum and put in bottle. For use add equal quantities of water and apply with spray-pump.

Mr. Reynaud, in *La Pom. Franc.* for 1910, March, p. 74, finds this mite has preference for certain varieties of pear; he gives the following notes for the department Hautes-Alpes:—

Varieties most attacked.—'Doyenné d'hiver,' 'Bergamotte Esperen,' 'Beurré Giffard,' 'Williams' Bon Chrétien.'

Varieties a little less attacked.—'Doyenné de Juillet,' 'Citron des Carmes,' 'Beurré Hardy,' 'Beurré Diel,' 'Beurré d'Amanlis,' 'Beurré d'Hardenpoint,' 'Passe Colmar,' 'Passe Crassane,' 'Doyenné d'Alençon,' 'Souvenir de Jules Guindon.'

Varieties still less attacked.—'Beurré Picquery,' 'Beurré de l'Assomption,' 'Epargne,' 'Fondante des bois,' 'Certeau d'Automne,' 'Louise Bonne d'Avranches,' 'Le Lectier,' 'Martin sec,' 'Catillac,' 'Beurré blanc,' 'Beurré Clairgeau.'

Varieties least attacked.—'Bon Chrétien d'été,' 'Belle de Mai,' 'Clapp's Favourite,' 'Royale d'Hiver,' 'Belle des Abrès,' 'Curé,' 'Virgouleuse.'—*C. H. H.*

Pear Thrips and its Control, The. By Dudley Moulton (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 80, part iv.; Sept. 1, 1909;

3 plates, 5 figs.).—The pear thrips has been found only near San Francisco Bay. The adults injure the trees by rasping the tissues and sucking the sap from the young buds and blossoms.

If land is ploughed as soon as possible after the early rains in October, November, and December, to a depth of seven to ten inches, and afterwards well harrowed, the pupæ are broken from their protecting cells and injured or killed.

Sprays of tobacco-extract in combination with oil emulsion should be used in early March and again in April.—*V. G. J.*

Peat Mosses, Plants in. (*Bot. Gaz.* vol. xlix. pp. 325-339; May 1910).—The full title of this paper is "Physiologically Arid Habitats and Drought Resistance in Plants."

The author found that in samples of bog water kept in a well-corked glass jar (at 20°-25° C. and in the dark) methane and other gases are developed. In a few weeks a thin surface layer formed on the liquid, which consisted of bacteria embedded in a matrix. The exclusion of air prevents further growth of the bacteria, which are aerobic.

Litre flasks containing a sterilized solution of bog water were then infected with pure cultures of some thirty-five species of these bacteria which had been isolated by the author. As a control he retained several flasks with the sterilized solution, and which were not inoculated. Some flasks were also infected with 1 c.cm. of fresh bog water in the litre.

Wheat seedlings, specially prepared, were grown in all these solutions. The transpiration was found to be much reduced in those plants grown in bog water, being only 30·79 per cent. of that given by plants in the control flasks. In the bacterial cultivation the transpiration was also much less than in the controls, being only from 68 to 79 per cent.

In some of the pure bacterial cultivations indol and ammonia were produced, but no further decomposition occurred. In the bog water solution amido-acids were further transformed, yielding ammonia and compounds of the fatty acid series. Some of the bacteria also decompose carbohydrates, for if air is admitted litmus paper may be dissolved, but these were not isolated.

It seems that a whole series of bacteria are concerned in the process. The injurious products of this bacterial bog-flora accumulate in definite layers of the peat.

These toxic substances are retained in soils used for filtering bog water. Plants grown in such contaminated soil were deficient in dry weight to the extent of 18 per cent. in sand, 3 per cent. in clay, and 36 per cent. in humus.

It is these poisonous products which prevent some plants from colonizing bog water or bog soil and interfere with the proper development of others. Some plants can accustom themselves to such toxic substances. By rearing plants in gradually intensified toxic solutions they may acquire a much higher resisting power than they possess when

grown under normal conditions, and this special power may become a permanent inheritable character.

Different varieties respond in different ways to new conditions, and the variants of one variety "depart in both directions from the normal."

The author thinks that it is by this power of resistance, by diminishing the rate of absorption, compared with transpiration, in the presence of poisonous products that plants succeed in establishing themselves in physiologically arid habitats, such as peat.

They are not so much assisted by developing xerophytic characters. Neither the low temperatures in peat mosses nor differences in acidity and osmotic pressure have much effect.—*G. F. S.-E.*

Philadelphus 'Mer de Glace.' By Hort. (*Le Jard.*, vol. xxiii., No. 542, p. 277; Sept. 20, 1909; 1 fig.).—A new hybrid, differing from *Philadelphus Lemoinei* by its large leaves and fine flowers. It has a very regular habit of growth. The branches, which bloom profusely, are short and erect. They bear a quantity of double rose-like flowers, with very large outside petals and narrower petals inside, of a fine silvery white.—*F. A. W.*

Pine Sawyer, The Southern (*Monohammus titillator* Fab.). By J. L. Webb, M.S. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 58, part iv.: Nov. 10, 1909; 24 figs. bibliography).—This insect, as far as is at present known, attacks only felled or injured pine trees.

The adult female is a long, mottled gray and brown beetle, varying from 16 mm. to 31·5 mm. in length, and from 5 mm. to 10 mm. in width. She digs a funnel-shaped pit in the bark of the tree, preparatory to laying her eggs. As many as nine eggs have been found in one pit.

In about five days the larvæ hatch out and commence feeding on the soft inner bark, and soon work their way through it. Eighteen to thirty-two days after hatching they mine into the sap-wood, making tunnels or galleries till the heartwood is reached. The pupal period is passed in a cell in one of these galleries, the adult beetle emerging by boring a perfectly round exit hole three-eighths of an inch in diameter.

The beetle has several natural enemies, but they are not powerful enough to be of much service. At Baxterville, Miss., in 1908, the felled timber was burned over with the object of destroying broods of larvæ, but very few of them succumbed to the heat.

The author recommends that all storm-felled trees should be sawn into logs and placed in water before the larvæ enter the wood, or within forty days after the eggs are laid. If it is impossible to place the logs in water they should be barked within forty days after the first egg-pits are discovered.—*V. G. J.*

Plant Associations of the Sudetic Alps. By Prof. Laus (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft i. pp. 103-131; 1909).—The author

gives a very full description of a small part (the Gross Kessel) of these mountains. He distinguishes the following associations:—

(1) The upper Sudetic fir wood of the lower slopes and spurs; (2) the formation of "Krüppelhölzer" (bush or scrub), with *Picea*, *Pyrus Aucuparia*, &c., to about 1300 metres; (3) the mountain heath; (4) "Quellfluren" (water-sides and wet ground); (4) the moor; (5) rock and gravel formation.

Lists are given of the characteristic plants, as well as of the mosses and lichens in each of these formations. The flowering plants are classified as follows: cosmopolitan, circumpolar, circumpolar alpines (high mountain plants), European, Euro-Siberian, Eurasiatic, and European alpine plants.

In most cases also an attempt is made to describe the various "facies" which occur in the larger groups.

There are in the mountain heath formation, for example, some "facies" in which Cryptogams preponderate, as, *e.g.*, *Mossed Lichen*, which occurs on dry soil deficient in plant food, and *Athyrium alpestre*, which occurs on sufficiently wet ground with humus. Also in the same formation are such facies as the *Nardus*, the *Juncus trifidus*, the *Calluna*, and the *Vaccinium Myrtillus* facies.

It will be seen, therefore, and especially as the descriptions of these facies are not only very clear but very complete, that this paper should certainly be consulted by British botanists who are interested in ecology or vegetation surveys.—*G. F. S.-E.*

Plant Diseases in Nebraska. By E. Mead Wilcox and R. E. Stone (*U.S.A. Exp. Stn. Nebraska, 22nd Ann. Rept.* pp. 25-63; 1909).—This paper might be described as a short, practical handbook of 74 of the most important fungus pests in Nebraska. The symptoms and general life-history of each of these disease fungi are given in a form which should be quite easily understood by the average layman. References to recent papers on these fungi are also given, and there is a short account of the preparation and uses of ammoniacal copper carbonate, lime-sulphur, and other fungicides.—*G. F. S.-E.*

Plant Diseases in S. California, 1906-1909 (*U.S.A. Exp. Stn. California, Bull.* 203; 1909).—The report gives a general description of the work of the various experimental stations in California.

Pear blight has been found to be due to a bacillus. The leaves, flowers, shoots, and body of the tree near the ground are affected. A large amount of infection is carried by insects, and many trees become infected near the ground or in the butt below the surface of the soil. From there the blight spreads to the roots and kills the tree.

Remedies suggested are: (1) careful cultivation; (2) keeping the trunks clear of shoots and suckers, as infection takes place through the latter; (3) use of immune or disease-resistent stocks.

The stock known as 'Le Conte' has proved best for Bartlett pears,

which is the only variety of pear grown in any quantity in California. The 'Le Conte' stock strikes freely from cuttings, produces a stem free from suckers and shoots, and is almost immune. The seedling stock has the two vital defects of suckering freely and being susceptible to the blight.

The remedies suggested for walnut blight in California are on the same lines—namely, careful cultivation and the use of disease-resisting stocks, California black walnut, *Juglans Hindsii* (N. California), and *Juglans californica* (S. California).

The best varieties are 'Eureka,' 'Concord,' 'Chase,' 'San José,' and the French varieties, 'Tranguette' and 'Mayette.'

The dying back of apricot fruit-buds has been found to be due to *Coryneum Beyerinckii* (the peach-blight fungus), and the black spots on the fruit, which cause it to split, is *Cladosporium carpophyllum*.

In the case of apple mildew the best results were obtained by spraying with sulphides or sulphur-containing sprays in spring and early summer.

Whole plantations of tomatos are reported to have been completely ruined in 1907 by *Phytophthora infestans*. Bordeaux mixture after rain was found to be the most effective remedy.—*D. M. C.*

Plantae Straussianae. By Dr. J. Bornmüller (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft iii. pp. 434-444; 1910).—The description of the plants collected by Th. Strauss in West Persia in the years 1889-1899 is here completed. This contribution contains the Cyperaceae, Graminaceae, Coniferae, Gnetaceae, Filices, and Equisetaceae, with a list of localities and index.—*G. F. S.-E.*

Plum Aphis, The Southern (*Aphis sectariae*, Thos.) By C. E. Sanborn (*U.S.A. Exp. Stn., Oklahoma, Bull.* 88; Mch. 1910; 5 figs.).—The wingless aphis, which begins the attack on the plum in the spring, is known as the "stem mother," and hatches from an egg deposited the previous autumn. This "stem mother" can produce young at the rate of two to five a day for a period of four weeks. The young grow quickly and reproduce rapidly, and winged forms develop which fly to other trees, there to establish fresh colonies.

When the terminal branches of the tree have finished growing and the leaves are toughened with age the aphides leave the trees and establish wingless colonies on certain grasses growing in the locality. From this wingless form winged "migrants" arise at the fall of the year which travel to the plum trees and found new colonies in the spring.

Autumn spraying with lime-sulphur is recommended for destroying the eggs, and as a summer remedy tobacco-water.—*V. G. J.*

Pollen, Some Conditions which Influence the Germination and Fertility of. By E. P. Sandsten (*U.S.A. Exp. Stn. Wisconsin, Research Bull.* 4, June 1909; 5 figs.).—The author found that ripe pollen of apples, pears, and plums was not greatly injured by a tem-

perature of −1·5° C., but the pistil was liable to injury at that temperature. High temperatures—50°-55° C.—so long as the air was dry did not seriously affect the pollen, but the same temperatures with a moist atmosphere caused the bursting of the grains. The pollen of tomatos and lilies did not develop well in the absence of sunshine. Lack of cultivation and fertility in orchards is said to injure greatly the production and fertility of pollen. Plum pollen appears to be short-lived, but apple pollen can be kept alive for six months in a dry place at a temperature ranging from 7° to 26° C. If the conditions are favourable the pollen soon germinates and the tube may reach the ovary of apples, plums, or cherries in from nine to thirty-two hours after pollination. The stigma of the apple is receptive for from four to six days, but wet weather is fatal to it.—*F. J. C.*

Potash in Clay Soils. By F. W. Morse and B. E. Curry (*U.S.A. Exp. Stn. New Hampshire, Bull.* 142; Dec. 1909).—The heavy clay and clay loam soils used for these experiments appear to have been formed from granitic rock by glacial action. They contain 1 per cent. of potash.

The amount of potash absorbed by hay grown on a large number of soils was found to be proportionate to the yield of hay. Liberal fertilizing with potash produced no perceptible effect either on the yield of hay or of clover, nor on the percentage of potash absorbed by these plants. Practically by doubling the yield the amount of potash in the crop is doubled.

The amount of potash in solution in the soil moisture was found to be 80 parts of potash in the million of water, whilst the approximate concentration required for the heaviest yields was 58 parts per million.

The available amount of potash can be increased by growing leguminous crops ploughed in green or returned as manure. Lime produced no effect, but feldspar in water treated with lime and gypsum yielded more than double the amount of potash. Clay interferes with this process, and so conserves the potash in the soils. Experiments are given which show the absorptive power of clay, sandy clay, and sandy loam soils in relation to potash. Out of 1·50 gram of potassium chloride added 0·980 gram was made insoluble in clay, 0·615 in sandy clay, and 0·510 in sandy loam. The actual soil fertility is kept very nearly constant, because what is carried down in rainy weather is carried up and left on the surface by evaporation in fair weather. When potash is rendered insoluble other bases go into solution. Lime has decided effects on these by-products.

G. F. S.-E.

Potato Culture in Northern Wisconsin. By E. P. Sandsten and E. J. Delwiche (*U.S.A. Exp. Stn. Wisconsin, Bull.* 177; 1909).—The sandy soils of this region are well suited to potato-growing, but require manuring, for which purpose a heavy crop of clover, ploughed in green, is the best, yielding 241 bushels, as compared to

197 bushels with 10 tons stable manure, 192 bushels with 700 lb. fertilizer, and 174 bushels with no fertilizer.

Spraying with Paris green or arsenate of lead for the potato bug, and with Bordeaux mixture for blight, must be done *thoroughly* (sometimes five times in a season) and *early* to be really effectual.

The different results of depth in planting are interesting, 4 inches yielding 140 bushels from the acre, 6 inches 124 bushels, and 8 inches 102 bushels.—*C. H. L.*

Potato-growing in North-East U.S.A. By L. G. Dodge (*U.S.A. Dep. Agr. Farmers' Bull.* 365 figs.; 1909).—There are ten States in the North-East that make a speciality of growing the White or Irish potato. Amongst these Maine (and especially Arootook County) takes the lead. Different methods are practised in different parts of these States, but as a rule the crop is grown in a three-year rotation with wheat and clover.

Thorough cultivation (up to fourteen times), spraying (three to five times), judicious manuring (farmyard manure the best, but commercial next), together with selection of seed, are essential, but practice varies in the different localities.

All the operations of planting, cultivation, and digging are effected by machinery, two men being capable by this means of dealing with 50 acres, but seven or eight extra hands are required for picking up the crop when dug.—*C. H. L.*

Preserving Vegetables for Winter Use. By Miss Blanchard Harper (*Ann. Rep. Wisconsin State Hort. Soc.* 1909, vol. xxxix. p. 214).—Useful hints and directions for "canning" peas, asparagus, beans, beets, maize, and tomatos, that should be of great service to those who wish to "eat all they can, and can all they can't."

E. A. B.

Prickly Pear as Cattle Food. By R. F. Hare (*U.S.A. Exp. Stn. New Mexico, Bull.* 69; Sept. 1908).—Cattle were fed on various species of *Opuntia*, and the digestibility of these, either alone or with other foods, is very carefully investigated. Prickly pear has a greater food value than is shown by its analysis or by its digestion coefficients, at least when fed with cured fodders or grains, for then the digestibility of the latter is increased. The steers seldom drank water when receiving 100 pounds of this food a day. When fed with this material only, the animals scoured quite badly.—*G. F. S.-E.*

Potatos, A Variety Test of. By C. F. Noll (*U.S.A. Exp. Stn. Pennsylvania, Bull.* 98).—This bulletin gives the results of four years' experiments with about forty varieties of potatos—early, medium, and late. Those giving the highest average yields are named in order of merit.

To prevent scab the seed potatos are soaked for an hour in a solution of one pint formalin (40 per cent. strength) to twenty-five gallons

water. Formalin is safer to handle than bichloride of mercury and just as effectual.—*C. H. L.*

Primula obconica, Remedy for Chlorosis. By G. Arends (*Le Jard.*, vol. xxiv., No. 550, p. 27; Jan. 20, 1910).—The simultaneous application of sulphate of iron and nitrate of soda has a miraculous effect upon this troublesome disease. The etiolated leaves resume their natural colour, and the new leaves come up green. Dose, 50 gr. iron sulphate, 50 gr. sodium nitrate, to 100 litres water. Of this take 1 1000th part (1 gr. per litre). In a week the effect will be marked.—*F. A. W.*

Primula sonchifolia. By G. Forrest (*Gard. Chron.* xlvii. (1910), p. 58; Jan. 22; fig.).—This pretty little species with blue flowers, native in N.W. Yunnan, is illustrated. It flowers before the leaves appear, but is difficult of cultivation in this country, sharing this characteristic with many of the alpine species.—*F. J. C.*

Ray-flowers of Composites, Variation in Number of. By Dr. Paul Vogler (*Beih. Bot. Cent.* xxv. 1. Abt. Heft iii. pp. 387-396; with 5 figs.; 1910).—Further observations of *Chrysanthemum Parthenium*, *Boltonia latisquama*, and *Senecio alpinus* are given. In the first-mentioned he found that of 1750 flowers on manured soil 250 had 21 ray-florets, whilst of 370 from not manured soil 69 had 13 ray-florets.

The *Boltonia* showed a tendency to the Fibonnaci number, 55 (56, 55, 56 in one garden, 1907, 1908, 1909; 55, 54, 53 in another garden; and 56 in "Park," 1909). In one year, 1907 (Park), the greatest frequency was 61.

Of the *Senecio* 3100 heads were examined, with the following results: the Rigi (500 examined), 1600 metres alt., 1906, 22 ray-florets in 89 heads; the Rigi (500 examined), 1300 metres alt., 1906, 19 ray-florets in 94 heads; the Rigi (250 examined), 1500 metres alt., 1906, 19 ray-florets in 48 heads; St. Gall (400 examined), 700 metres alt., 1907, 21 ray-florets in 80 heads; St. Gall (700 examined), 700 metres alt., 1907, 20 ray-florets in 128 heads; Rigi (500 examined), 1300 metres alt., 1908, 19 ray-florets in 70 heads; Rigi (250 examined), 1300 metres alt., 1908, 19 ray-florets in 40 heads.—*G. F. S.-E.*

Rhododendron Benthamianum, Hemsl. By W. B. Hemsley (*Gard. Chron.* xlvii. (1910), p. 4; Jan. 1).—This new species is similar in growth to *R. Harrovianum* (q.v.), but has shorter leaves, green pedicels, and flowers purple throughout. It was raised by Messrs. Veitch from seed collected by Mr. E. H. Wilson in W. China.—*F. J. C.*

Rhododendron Harrovianum, Hemsl. By W. B. Hemsley (*Gard. Chron.* xlvii. (1910), p. 4; Jan. 1).—This is a new species raised by Messrs. Veitch from seed collected by Mr. E. H. Wilson in W. China. It is a dwarf, small-leaved evergreen plant, bearing small flowers of the colour of *R. ponticum*.—*F. J. C.*

Rhododendron primulinum, Hemsl. By W. B. Hemsley (*Gard. Chron.* xlvii. (1910), p. 4; Jan. 1).—Consists of a description of this beautiful species, which reaches a height of 1½ feet to 2 feet and produces its rotate, yellow flowers when only a few inches high. A new species raised by Messrs. Veitch from seed collected by Mr. E. H. Wilson in W. China.—*F. J. C.*

Rhubarb Flower (*Le Jard.*, vol. xxiv. No. 554, p. 95; March 20, 1910).—The young flowering shoots of rhubarb are said to be quite as good to eat as the cauliflower. They should be cooked like rhubarb, and provide an excellent and tender vegetable.—*F. A. W.*

Roses, Hybrid. Multiflora and Wichuraiana (*Le Jard.*, vol. xxiii., No. 543, p. 295; Oct. 5, 1909; with 9 figs. and one coloured plate).—An interesting article on the various hybrids that come under the above classes, with suggestions as to the many ways in which they can be employed in landscape gardening.—*F. A. W.*

Rotation of Crops. By W. M. Hays, Andrew Boss, A. D. Wilson, and Harry Snyder (*U.S.A. Exp. Stn. Minnesota, 16th Ann. Report,* pp. 283-358; with 13 figs.; 1908).—A series of careful experiments on 44 plots, to test the effect of rotation on average yield and on the chemical and physical condition of the soil, have been carried out for ten years at this station. It is shown that in five years the total fertility removed by continuous wheat was 148 lb. nitrogen, 84·6 lb. phosphoric acid, and 148 lb. potash. With rotation 115 lb. nitrogen, 141·5 lb. phosphoric acid, and 383·6 lb. potash were removed. Rotation, with the use of farmyard manure, improves the condition of the soil (chiefly by the effect of decomposition in producing acids which render more mineral constituents soluble, and therefore available as plant food).

Vegetable matter may be added to the soil much more cheaply than commercial fertilizers. Many New England farmers used these last until their soil no longer paid for the use of fertilizers, and were eventually forced to abandon their farms.

The details of the 44 plot experiments are given in full, and contain much that is of great interest to farmers and agriculturists. The value of each crop during the years 1893-1904 is calculated in dollars. The difference in the crops of Indian corn, when grown continuously (average 16 bushels) and when grown as a rotation crop (48·2 bushels) is very marked. Very poor results were also found when potatos, mangels, and peas were grown continuously on the same land. When wheat was grown continuously there was a gradual steady decrease in the yield. This was less marked when 6 lb. of Red Clover was sown on the acre. The value of clover comes out very clearly in these tables, not only on account of its direct nitrogen-forming effect, but also by its preventing the development of weeds. Flax was not found to be a hard crop on the soil.

Soils rich in humus were found to retain more water and larger amounts of phosphates and of carbon dioxide.

On exhausted soils fertility cannot be restored by nitrogen alone. Chemical, physical, and bacteriological changes are promoted by the use of farmyard manures, by a clover sod, and by grass crop residues. Cultivation cannot take the place of manures, neither can manures take the place of cultivation.

In the case of 12 plots cultivated on a rotation of wheat, clover and wheat (2 years), oats, and Indian corn it was found that after 10 years 10 of the 12 plots contained *more* nitrogen than at the beginning of the period. Nearly 500 lb. of nitrogen was also removed from each acre by these crops during the 10 years. The amount of humus in the soil was also maintained, being 3 per cent. at the beginning, and 3·06 at the end of the period. During this time, however, the land was twice manured (farmyard) at the rate of eight tons to the acre.

As regards potash contents, they were at the beginning 178 and at the end 153 parts in the million of potash soluble in fifth normal nitric acid. There was no material change in the solubility of phosphate compounds.

On the other hand under timothy without clover there was a loss (0·017 per cent.) of nitrogen. Indian corn seems to conserve the nitrogen to a greater extent than roots. All combinations of wheat and clover showed an increase of soil nitrogen. The losses of nitrogen and of humus under 10 years' continuous cropping of wheat, Indian corn, potatos, and mangolds averaged 16 per cent. Lime, alkaline matter, and aeration of the soil assist in producing rapid nitrification. About 1 ton to the acre of organic compounds has been lost annually on the plots where grains and roots only have been grown. These extracts will be sufficient to show the great practical importance of this paper.—*G. F. S.-E.*

Rubus, Ornamental Varieties of. By Ch. A., A. v. der Heede, and Hort. (*Le Jard.*, vol. xxiv., No. 555; April 5, 1910; 2 figs.).—The many kinds of ornamental bramble, which are apt to be neglected, are enumerated. Among the best are *R. flagelliformis*, with heart-shaped leaves and white flowers; *R. innominatus*, edible, with tri-partite leaves and clusters of orange-scarlet berries; *R. lasiostylus*, with red flowers; *R. platyphyllos*, edible, shrub with annual shoots, white flowers, and big conical purple fruits. These are all hardy, but there are also some charming greenhouse varieties, *i.e. R. rosaefolius* and its double form, *R. r. coronarius*, or *R. r. florepleno*, and *R. reflexus* or *R. moluccanus*. This last has ivy-shaped leaves, like pale green velvet with brown veins.—*F. A. W.*

Sand Plains in Vermont, Natural Afforestation of. By C. D. Howe (*Bot. Gaz.* vol. xlix. pp. 126-148: with map and 15 figs.; Feb. 1910).—This interesting "study in succession" will repay care-

ful examination by every botanist who has worked on plant associations or ecology.

The country studied consists of three plains, with a soil varying from sand to sandy loam, and which were the deltas of the Winooski River at various periods, just at its entrance into Lake Champlain.

The country was originally forest-covered, probably with white pine (*Pinus Strobus?*) dominant. When this was cut over, pitch pine (*P. rigida*) became the controlling trees of the second generation, with undergrowth of *Myrica*, *Pteris*, *Kalmia*, *Vaccinium* spp., *Carex*, *Diervilla*, *Solidago*, and *Rubus* in some cases.

Elsewhere, on less sandy soils, *Quercus velutina* and *Q. alba* formed about one-third of the pitch pine forest.

The pitch pine was subsequently cut out, and, in consequence, *Myrica* and *Pteris* became dominant, with beneath them a carpet of *Vaccinium*.

When periodically burnt this association becomes so dense as to allow no trees to grow, and as many as 60 *Myrica* plants may be found on a square metre. This *Myrica-Pteris* association, if not burnt, begins to die out at 15 to 20 years old, and pitch pine establishes itself in the open places. It seems probable that eventually, if unmolested by man, such areas will regain their dominance of pitch pine.

When fire is kept out from the time of clearing reafforestation is more rapid. Coppice shoots of Oak, *Betula populifolia*, Aspen, red maple, and *Amelanchier* fill up the vacant spaces. When the Oak coppice is about 15 years old it shades out much of the under-vegetation, and the pines begin slowly to re-establish themselves. Pitch pine enters more slowly than the white pine, which endures shade better.

White pine reproduces readily on clean-cut areas where the white birch is dominant. The latter tree persists only for 20 to 30 years in competition with oaks and pines.

On abandoned cultivated fields trees may (1) at once begin to establish themselves, as when a ploughed field near mature trees is abandoned in a heavy seed year. In other cases (2) there is a preliminary herbaceous stage, but the grasses never obtain complete control so as to form sods. (3) Areas cropped for grass or pastured for a longer or shorter time, and then abandoned, pass through a sod-forming stage.

Of the succession (1) examples of seeding by white birch and pitch pine are given. As regards (2) the fields are at first occupied by weeds, such as *Setaria* and *Erigeron canadensis*, which may continue for four years. Later *Oenothera biennis*, Sheep's sorrel, *Antennaria*, &c., come in, with scattered groups of *Cyperus*, *Carex*, and grasses such as *Danthonia* and *Andropogon*. Mosses (*Polytrichum*) appear in sterile places, often covering one-third of the area. These patches of *Polytrichum* are ideal germinating beds for pitch pine, white pine, and white birch. Usually *Myrica* precedes the tree invasion. The rapidity of afforestation depends on the proximity of mature seeding trees.

In the third case, when the fields were seeded down and bore crops

of hay or were pastured, the chief sod-formers seem to have been *Poa pratensis* and *Danthonia spicata*. The *Poa* seems to die out and is replaced by *Danthonia*, which in course of time gives way to *Polytrichum commune* (along with these are *Cyperus*, *Panicum*, *Spiraea*, Silverweed, Sheep's sorrel, *Aster*, and *Solidago*). The tree invasion begins on these patches of *Polytrichum*. Older stands of pitch pine show regeneration of white pine beneath them.

In the sapling stage the pure stands of white pine are usually so dense as to exclude secondary vegetation, but when 30 years old they have become sufficiently thinned out to allow of undergrowth.

The figures show the distribution of the various plants actually found on sample plots 5 yards or 1 yard square.

As will be seen from this short sketch the paper is of great importance to those interested in forestry.—*G. F. S.-E.*

San José Scale in Arkansas. By C. F. Adams (*U.S.A. Exp. Stn. Arkansas, Bull.* 102; 1908).—The San José Scale is more injurious than the codlin moth, as it destroys not merely the crop but the trees, peach, apple, and plum suffering most. It can be controlled by spraying with lime and sulphur wash—lime 21 lb., sulphur 18 lb., water 50 gallons.

Make the sulphur into a thick paste with cold water; next stir in a few gallons of boiling water, add lime, boil for 30 or 40 minutes; make up to 50 gallons.

Should be sprayed while warm. Being corrosive it should only be applied while the trees are dormant. Brass spray pumps are preferable to the ordinary kind, which soon corrode.

If the pest is discovered in summer it can be held in check with a 15 per cent. kerosene emulsion once every three weeks—2 lb. laundry soap dissolved in 4 gallons of water. Pump this into 8 gallons of kerosene, so as to make a thick, creamy solution. Add enough water to make 54 gallons. Stringent legislation is required to deal with this pest in Arkansas.—*C. H. L.*

San José Scale, Spray for. By J. L. Phillips (*U.S.A. Exp. Stn. Virginia, Bull.* 179; Oct. 1909).—Methods are described for preparing a home-made soluble oil for use against this dangerous pest. The materials are caustic potash (90 per cent.), menhaden or fish oil, liquid crude carbolic acid (100 per cent.), paraffin oil, crude oil, and rosin oil.

Orchard tests are given showing the results obtained by the use of these preparations. If made after these formulæ the oils are said to cost from 11 to 16 cents (5½*d.* to 7½*d.*) per gallon.—*G. F. S.-E.*

Scale Insects: New Species of Diaspine. By C. L. Marlatt (*U.S.A. Dep. Agr., Bur. Ent. Technical Ser.*, No. 16, Part II., 1908; with 9 plates).—Descriptions are given of seventeen new species, "mostly insects of potential economic importance," of which four

are native to the United States and the remainder foreign (China, South Africa, Australasia, &c.).—*G. F. S.-E.*

Seed Tests in Nebraska. By E. Mead Wilcox and Miss Stevenson (*U.S.A. Exp. Stn. Nebraska, Bull.* 110; with 12 figs.; 1909; also *Twenty-Second Annual Report* of the same station, pp. 143-158; Feb. 1909).—The paper gives an account of the weed seeds found, percentages of purity and germination in over 1000 samples forwarded to the laboratory and examined free of charge. Many of the seeds are illustrated.—*G. F. S.-E.*

Sex Inheritance in Lychnis. By G. H. Shull (*Bot. Gaz.* vol. xlix. pp. 110-125; with 2 figs.; Feb. 1910).—It was found that hermaphrodites occur in *Lychnis dioica* to the extent of one in 1000 or less. He himself discovered six hermaphrodite individuals in 8000 examined, and last season eight in 10,320 individuals. Four (A, B, C, D) of these were successfully used in breeding, with the following results: When self-fertilized, A yielded 33 females, 25 hermaphrodites, and no males; B yielded 110 females, 95 hermaphrodites, and 2 males; C and D gave no result. When pollen of A was used to fertilize normal female flowers the results were 236 female, 161 hermaphrodite, and 11 male flowers. When B was used as pollinating parent the result was 162 female, 144 hermaphrodite, and no male flowers. C as pollen parent gave 39 females and 55 males, all normal. D as pollen parent gave 26 females and 18 males, all normal. When pollinated by normal male pollen C and D gave no result; A gave 21 females, 2 hermaphrodites, and 11 males (B apparently was not investigated). The discussion of these results and of the general question of Mendelian sex inheritance occupies most of the paper.

G. F. S.-E.

Soil Fertility. By C. G. Hopkins (*U.S.A. Exp. Stn. Illinois, Circ.* 123 *and* 124).—The author in 1906 criticized with considerable freedom certain conclusions published by Professor Whitney, Chief of Bureau of Soils, U.S. Department of Agriculture.

These conclusions are given as follows:—

"1. All ordinary soils, including so-called exhausted soils, contain sufficient plant food for good crop yields, and this supply will be indefinitely maintained without the addition of any of the plant-food elements.

"2. Most agricultural plants, and probably all of them, excrete substances that are poisonous to the plant furnishing the excreta. Weeds are poisonous, or excrete substances that are poisonous to agricultural plants. So-called exhausted soils contain substances that are poisonous to all agricultural plants.

"3. The fertilizers we add to the soil have their effect on these toxic substances, and render the soil sweet and more healthful for growing plants. It is through this means that our fertilizers act rather than through the supplying of plant food to the plant.

"This is the way stable manure and green manures act. This is the principal office of nitrate of soda, potash, and phosphoric acid."

It will not be thought surprising that Dr. Hopkins protested vigorously against the circulation of such ideas. Dr. Davenport points out that "the logical conclusion of this theory of the Bureau of Soils is that in practical farming operations all matters of fertility may be neglected, provided only the proper rotations be maintained."

It is not perhaps advisable to enter further into the controversial part of these papers. It is interesting to find that Sir Humphry Davy in 1839 mentions supposed excretions from roots "injurious to the plants which have yielded them and yet beneficial to other kinds of plants."

But, as Dr. Hopkins shows, there is a limit to the absolute total of plant food in all soils. The average prairie soil of more than twenty counties in Illinois contains so limited a supply of phosphorus that sixty years of the best crops would require every pound of it (to a depth of one foot).

Although it has long been known that soluble materials are brought up from the subsoil by capillary moisture, yet there is no question that the drainage water removes large amounts of plant food. From 75 to 90 per cent. of the original rock formation (in limestone soils) is not infrequently removed by leaching. Dr. Hopkins also shows that Professor Whitney's theories are not borne out by the results of the Rothamsted experiments (in which he is supported by Dr. Hall). The official Agricultural Chemists' Association appointed a committee of seven to examine the subject. Six out of the seven uphold Dr. Hopkins both in his criticism of Professor Whitney's data and in his protest against the teaching of such views to practical farmers.—*G. F. S.-E.*

Sphagnum for Cuttings. By A. van der Heede (*Le Jard.*, vol. xxiv., No. 552, p. 59; Feb. 20, 1910).—Cuttings strike well in a bed of fresh sphagnum 25-60 cm. deep. If kept moist by wetting the bottom of the moss, the temperature being from 15-20° C., roots will be thrown out in a few days—four to five for *Coleus*, eight to fifteen for Heliotrope, two to three for *Alternanthera*, and about a fortnight for Fuchsias. As soon as the roots appear the cuttings may be potted in a light soil, rendered porous by the use of white sand.

F. A. W.

Spraying. Ed. by Frederic Cranefield (*U.S.A. St. Hort. Soc. Wisconsin, Bull.* 19; April 1910; 15 figs.).—This bulletin contains excellent formulae for insecticides and fungicides compiled from various sources, and illustrations of spraying machines and pumps.

V. G. J.

Spraying with Arsenate of Lead. By H. M. Ashby (*Ann. Rep. Wisconsin State Hort. Soc.* 1909, vol. xxxix. p. 157).—Points out the advantages of this spray as compared with Paris green for extensive use: (1) it settles more slowly; (2) it is less likely to burn foliage.

E. A. B.

Squash Bug, The (*Anasa tristis*, De G.) By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Cir.* 39; revised Jy. 28, 1908; 3 figs.).—A number of remedies in use against the striped cucumber beetle and other insect enemies of cucurbits will assist in the destruction or control of this species.

If the precaution be taken to collect the vines as soon as the crop is harvested and burn them, many bugs in their different stages will be destroyed and the crop of insects will be reduced for the ensuing year.

V. G. J.

Squash-vine Borer, The (*Melittia satyriniformis* Hbn.). By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 38; revised Sept. 3, 1908; 2 figs.).—The parent of this insect is a beautiful medium-sized moth of the family *Sesiidae*, or clear-wing moths. The larva does immense damage to curcubits generally by boring through the stems, causing them to rot at the affected points.

In early publications this species was generally known as *Melittia ceto* or *curbitae*.—*V. G. J.*

Strawberry Weevil (*Anthonomus signatus* Say.). By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 21; revised Sept. 19, 1908; 5 figs.).—A revised edition of a circular describing the life-history and habits of this destructive pest. Preventives are preferable to direct remedies, and among those recommended are: (1) Covering the beds with muslin or a similar material to prevent the female weevil depositing eggs in the flower buds; the covering serves a two-fold purpose in protecting the flowers from frost, thereby hastening maturity. (2) Clean cultivation, such as burning weeds and clearing away and destroying litter. (3) Spraying with a solution of crude carbolic acid, used in the proportion of 1 part to 100 of water.—*V. G. J.*

Sugar Cane, Packing, for Transportation. By J. R. Bovell (*West Indian Bull.* vol. x. No. 2, pp. 142-145; 1909).—The most successful method of packing sugar-cane for planting is to cut it into 4-feet lengths, and pack in damp powdered charcoal, after dipping in Bordeaux mixture and sealing the cut ends with resin.

The canes have kept fresh after this treatment for three months, and rarely fail to grow when planted.

It is important to plant immediately the case is opened, as the buds often swell, and rootlets are produced at the joints, which should not be allowed to dry.—*C. H. L.*

Sweet Potato, Scarabee of the. By H. A. Ballou (*West Indian Bull.* vol. x. No. 2, pp. 180-196; 1909).—This insect is known in the Leeward Islands as "Jacobs," and is very troublesome, causing sometimes the loss of a third of the crop.

The insect was sent to England for identification in 1848, but no certain remedy has yet been devised to check it. The use of crushed raw potato mixed with arsenic has been successful as a bait, and another

remedy is the complete burying of all infested material when the crop is dug, especially with the addition of a good covering of lime.—*C. H. L.*

Temperature, Effect on Cell Structure of. By Dr. Georgevitch (*Beih. Bot. Cent.* xxv. 1. Abt. Heft ii. pp. 127-136; 1910).—The effect of extreme temperatures upon the structure of the cells in the root-tip of *Galtonia candicans* is detailed at great length.

G. F. S.-E.

Timbers of Jamaica. By W. Harris (*Bull. Dep. Agr. Jamaica*. i. 1909, p. 10; 16 figs.).—An extensive article, giving lists of woods suitable for various purposes, with local and botanical names, and short descriptions, with localities, of the trees.—*E. A. B.*

Tomatos for Early Market. By J. W. Lloyd and T. S. Brooks (*U.S.A. Exp. Stn. Illinois, Bull.* 144; 1909).—Details methods advised for growers in Illinois. Tomatos for growing commercially in the field are brought on in hot-beds (either fire or manure), the seed being sown in February, and the plants, after several shifts and thorough hardening, being planted out in May. The smooth varieties are preferable, and earliness should be striven for.

Home-mixed fertilizer (two parts dried blood, two parts steamed bone meal, and one part potassium sulphate) has been proved by experiment to be the best both for earliness and total yield. Pruning, either to single or more stems, does not increase early or the total yield, unpruned plants doing best; but training, *i.e.* tying to stakes, keeps the fruit clean and simplifies cultivation and spraying.

The latter is essential for "rust" or leaf-spot, though in some cases it would seem to check the early fruit, but materially increases the total yield. Bordeaux mixture is used, with the addition of Paris green for tomato worm if necessary.

Picking tomatos inevitably stains the hands, but a green tomato or crushed rhubarb stalk will remove most of the stain.

Tomatos should be rigidly graded for market, and the four-basket crate (with, if possible, twelve fruits to a basket) is the best package.

C. H. L.

Transpiration, Effect of Salts on. By H. S. Reed (*Bot. Gaz.* vol. xlix. pp. 81-109; with 9 figs.; Feb. 1910).—The author used paraffined wire pots for these experiments. He grew wheat seedlings in 189 different soils or soil extracts, and tested the effect of small quantities of the salts mentioned below on transpiration. In most cases he gives the amount of water transpired for each gram of green weight produced. When his control plants transpired 103·39 water for each gram of green weight, he found that the average transpiration of the nitrate of soda seedlings was 93·36, of sulphate of potash 97·95, of calcium phosphate 104·07, and of calcium carbonate 101·09.

In one sample of clay with nitrate of soda there was, along with an increase of growth, 31 per cent., a decrease in transpiration which was

only 69 per cent. of that in the control plant. In Portsmouth swamp soil he found only 71·2 per cent.

The transpiration for each unit of green weight is generally smallest when there is the greatest acceleration in growth—at least for sulphate of potash and nitrate of soda—but the reverse holds for calcium carbonate. Potash is more efficient than soda in diminishing the amount of transportation for each unit of green weight. This relative transpiration is increased by small amounts of inorganic acids, and perceptibly by organic acids, also (in a very marked manner) by pyrogallol and tannic acid, by alkalis and by the use of such absorbents as carbon, ferric hydrate, and quartz flour. The relative transpiration was reduced by various solutions of hydrochloric, nitric, and sulphuric acids.

G. F. S.-E.

Transpiration, The Relation of Hairy and Cutinized Coverings to. By K. M. Wiegand (*Bot. Gaz.* vol. xlix. pp. 430-444; with 1 fig.; June 1910).—Experiments with blotting-paper and flannel are discussed. The author concludes that hairy coverings are very efficient in wind, but scarcely affect transpiration in still air. Wax and cutin are always efficient.—*G. F. S.-E.*

Trees and Shrubs of New Zealand. By L. S. Gibbs (*Gard. Chron.* xlvii. (1910), pp. 97, 118, 131; Feb.).—This is an excellent review of the woody vegetation of New Zealand, with notes on the characteristics and habitats of the various species.—*F. J. C.*

Trifolium incarnatum, The Constituents of the Flowers of. By Harold Rogerson (*Jour. Chem. Soc.*, vol. xcvii., May 1910, pp. 1004-1015).—This investigation was conducted upon the flowering tops collected during June from a cultivated crop in Kent. Among other items there were separated ·006 per cent. of an essential oil with a strong persistent odour, a new glucoside which the author has named incarnatin, and an alcohol which melts at 58°-60° C. and which has been previously obtained from the wax of the bumble-bee, but has not hitherto been named, and which the author therefore designates "incarnatyl alcohol." Other substances found were oleic, stearic, palmitic, linolic, benzoic, and salicylic acids, pratol, quercetin, and a trace of a coumaric acid.—*W. A. V.*

Turkestan, Flora of. By O. and B. Fedtschenko (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft ii. pp. 157-188; 1910).—The "Conspectus Florae Turkestanicae" is continued. It comprises a list of all the species hitherto recorded from Prussian Turkestan. The present contribution contains the Rosaceae.—*G. F. S.-E.*

Veronicas, Shrubby, from New Zealand. By S. Mottet (*Le Jard.*, vol. xxiv. No. 555, p. 107; April 5, 1910).—Some twenty varieties of shrubby Veronica are enumerated, with their characteristics, and hints for cultivation.—*F. A. W.*

Vines, Seedling. By F. Charmeux (*Le Jard.* vol. xxiii., No. 545, p. 324; Nov. 5, 1909; with 1 fig.).—A suggestion that vineyards may be regenerated by seedlings instead of seeking out American varieties for grafting. It is a mistake to think that vines raised from seed are long before they fruit. On the contrary, they may bear in the year following the sowing. They should be treated exactly like the cuttings made "by the English method," on which good results are guaranteed.—*F. A. W.*

Viola, European Species of. By W. Becker (*Beih. Bot. Cent.* xxvi. 2. Abt. Heft i. pp. 1-44; with 3 figs.; 1909; Heft iii. pp. 289-390; 1910).—A systematic list of all the European species of *Viola* is given as understood by the author.

It does not seem as if his classification has been published for many of his subdivisions, and the terms used are followed by the symbol "ined."

As a rule he begins with what he calls "*Kollektivspecies*," such as *Viola canina*. These include often four or five other species, some described by the author himself, or by Jordan, or other critical systematist.

Even this is insufficient, however, for under these minor species are varieties and forms. The following quotation explains itself and requires no comment:—

"Die Varietäten der Blütenfärbung fasse ich in folgende Formen zusammen.

Var. *albiflora*, W. Bckr., ined.
Petala albida.
Var. *violacea*, W. Bckr., ined.
Petala violacea.
Var. *rosea*, W. Bckr., ined.
Petala rosea.
Var. *rubra*, W. Bckr., ined.
Petala rubra.
Var. *picta* (Mogqr. pr. var. V. hirtae), W. Bckr., ined.
Petala variegata."

The localities for England are ridiculously incomplete, and one is tempted to think that the author has entirely disregarded the work of every English botanist who has written on *Viola*.—*G. F. S.-E.*

Water, Measurement of. By E. Tappan Tamatt and R. D. Kneale (*U.S.A. Exp. Stn. Montana, Bull.* 72: with 14 plates; 1908).—Describes various methods of measuring the amount of water supplied in irrigation.—*G. F. S.-E.*

Weeds, Iron Sulphate Spraying for. By R. A. Moore and A. L. Stone (*U.S.A. Exp. Stn. Wisconsin, Bull.* 179; July 1909).—Wild mustard plants (*Brassica arvensis*) are best sprayed on a bright, warm day with a 20 per cent. solution of iron sulphate, and after the plants have formed three leaves. About fifty-two gallons to the acre

will not injure cereals, clover, or lucerne. Dandelions and daisies were also partially eradicated, but not thistles.—*G. F. S.-E.*

Weeds: Their Eradication and Control. By G. E. Adams (*U.S.A. Exp. Stn. Rhode Island, Bull.* 133; 1909).—The control and ultimate suppression of "the plant out of place that persists in growing where it is not wanted" has been the subject of experiments at Rhode Island.

Preventive and remedial measures are advocated, amongst others use of clean seed, hoeing and harrowing in early stages, crop rotation, spraying with sulphate of iron. The last is especially useful against daisies, mustard, and dandelions.

The most satisfactory results are obtained by a 20 per cent. solution, using 100 to 150 lb. of iron sulphate to the acre.—*C. H. L.*

Welwitschia mirabilis. By Prof. H. H. W. Pearson (*Gard Chron.* xlvii. (1910), p. 49; Jan. 22; figs.).—The author, who has obtained material from its native habitat in South Africa, describes this remarkable plant and figures its flowers and seedlings.—*F. J. C.*

Winter-flowering Sweet Peas (*Le Jard.*, vol. xxiv. No. 557, p. 139; May 5, 1910).—This interesting race of Sweet Pea comes from Algiers. The plants are very easy to grow, and come into bloom at Christmas. Sow in pots at the beginning of October, six seeds to a pot, filled with a mixture of three parts good soil, three parts leaf-mould and sand, with a little powdered bone-dust and soot. Keep the pots in cold frame or house till the frosts begin. Re-pot when the seedlings are fifteen inches high, and again when they are about 2 ft. high, using somewhat heavier soil each time. Use bamboo supports.

F. A. W.

Winter Precipitation, Storage of, in Soils. By John A. Widtsoe (*U.S.A. Exp. Stn. Utah, Bull.* 104; 1908).—It is important for the farmer who thinks of irrigating his farm to know whether it is likely to be beneficial in proportion to the expense and trouble involved. This series of tables gives the result of experiments made to ascertain how much moisture is stored in the soil and carried over from year to year, especially in the upper 8 feet, where it can be reached by the crop.

Summer fallowing and autumn ploughing do much to preserve soil moisture, and, properly carried out, will often render irrigation unnecessary.—*C. H. L.*

Yew Tree, Poisonous Nature of. By F. Kanngiesser (*Gartenflora*, vol. lix. pt. 11, pp. 238-240).—The poisonous nature of the foliage of *Taxus baccata*, and its danger to horses and cattle, is not pointed out in toxicological handbooks.—*S. E. W.*

Zinnia elegans, Variation of. By Paul Becquerel (*Jour. Soc. Nat. Hort. Fr.*, series 4, vol. xi. Jan. 1910, p. 97).—A curious case

is described where a border of zinnias was cut down to the ground after being badly affected by frost on May 20. The plants grew again and flowered, but the colour of the blooms was entirely altered in some cases. A white variety striped with red bore some quite red flowers; a purple-striped variety became plain purple, and plain-coloured varieties turned from red to white, etc. In some cases also there were curious modifications in the form and structure of the flowers; such alterations, as in other well-known cases, being clearly due to the modification of nourishment following on the suppression of the stem of certain shoots through the action of frost and through their removal at a certain stage of growth.—*M. L. H.*

Zoology, Agricultural. By H. A. Gossard (*U.S.A. Exp. Stn. Ohio, Bull.* 198, pp. 15-88; with 9 plates; Nov. 1908).—This is a short, thorough, and very clear account of all the most important friends and enemies of the American farmer and gardener among beasts, birds, and insects. In every case a remedy or means of prevention is described, and in a clear, plainly written fashion, which should be understood by any intelligent farmer. General programmes are given for the treatment of various special crops, and a monthly calendar showing what insect pests are likely to appear and what should be done. Altogether a most valuable and practical publication, at least for those who live in Ohio.—*G. F. S.-E.*

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PART III.

RAMBLING ROSES.

By G. L. PAUL.

[Read September 13, 1910.]

THE few notes which follow deal with Rambling Roses, their development and their possibilities. By "rambler" I mean something distinct from the ordinary climbing and pillar roses; I mean a variety which grows rapidly and throws out strong branches in various directions, and is usually well clad with foliage; it is, in every sense, a very vigorous form of climbing rose.

In looking through the catalogues of by-gone days one is struck by the fact that although some of our oldest roses were ramblers in the true sense of the word, yet it is this class that modern rosarians have left to the last in their efforts to obtain new varieties; and it is particularly noticeable that nearly all those ramblers that have lasted until the present day are whites, or white touched with pink. In the most recent catalogue of the National Rose Society we find the following old names still surviving: 'Felicité Perpetué' (introduced in 1828), 'Aimée Vibert' (1841), 'Bennett's Seedling,' 'Blairi No. II.,' 'Dundee Rambler,' 'Flora,' 'Madame d'Arblay' (which, by the way, was raised in England), 'Ruga,' 'The Garland,' and 'Splendens.' With the exception of 'Blairi No. II.' and 'Flora,' they are all whites.

'Felicité Perpetué,' the earliest of them all, is a reputed hybrid from *Rosa sempervirens*, the wild Italian briar, and others like 'Dundee Rambler,' 'Ruga,' and 'Splendens' are hybrids from the Ayrshire rose, *Rosa arvensis*, the wild white briar of our own country.

It may here be remarked how singular it is that while a number of varieties have been raised from the Ayrshire rose, we know of scarcely any that have come to us from the Dog Rose, the *Rosa canina* of

our hedges. Probably the only hybrid of merit we have is 'Una,' raised at Cheshunt from a cross between *Rosa canina* and 'Gloire de Dijon.' It would be most serviceable if someone would take up this plant and give us a new race with the distinct, beautiful habit of the Dog Rose. The Dog Rose is naturally prone to variation, and there are not only a number of sub-species, but also one or two natural hybrids like *Rosa alba*, so that the possibilities are great.

In old days there were also the 'Boursaults,' hybrids of *R. alpina*, of which probably only one survives—'Morletti,' retained for its colour; and there were some early hybrids of *R. multiflora*, such as *Russelliana*, still found in old gardens, and another, 'de la Grifferie,' occasionally used as a stock for budding. The old 'Seven Sisters' rose 'Grevillei' also belongs to this class. There were, too, a few double-flowered forms of *Rosa setigera*, the American prairie rose, like 'Baltimore Belle' and 'Prairie Beauty,' which were among the best. 'Reine Olga de Wurtemburg,' even better still, also belongs to this class. There were added from that time up to recent days comparatively few real ramblers. Introductions like 'Gloire de Dijon,' 'Rêve d'Or,' and other Noisettes cannot in the strictest sense be termed ramblers. The raisers of new roses seem to have devoted themselves almost exclusively to the improvement of Hybrid Perpetuals and Teas. 'Claire Jacquier,' 'Paul's Single White,' 'Reine Olga de Wurtemburg' were among the rare additions during this period, until in 1893 the rose world was startled, as it had perhaps never been before, by the appearance on the scene of Turner's 'Crimson Rambler,' which, coming so unexpectedly and being so well exhibited, revealed infinite possibilities for new effects in rose gardens. It was inevitable that the attention of hybridists should at once be directed to this new class. Three years later, what was one of the first hybrids from 'Crimson Rambler,' our Cheshunt rose 'Psyche' was introduced, followed a year later by 'Wallflower,' and three years later still by 'Tea Rambler,' a hybrid between 'Crimson Rambler' and a seedling Tea, but suggesting by its vigour and growth, so much surpassing the rambler, some very rampant ancestor.

Introductions from all parts of Europe and America followed closely upon one another, and the use of rambler roses in our rose gardens increased rapidly year by year.

The reintroduction of the Japanese species, *Rosa Wichuraiana*, at this moment was most opportune, and a young American named Manda, by what was little less than a stroke of genius, using this almost evergreen species, introduced at once striking new features into our rambling roses. The dense foliage and late flowering of that species at once brought in new qualities; and later still, when this new class had been more fully developed, Walsh, another American, and others, by a happy thought, combined the results obtained with the Multifloras with those gained in the hybrid Wichuraianas, thus giving us such varieties as 'Lady Gay' and 'Hiawatha,' possessing the best qualities of both sections, and which, if not perpetual, at least by their

late flowering, extend the season and particularly lend themselves to decorative purposes. The introduction of these, amongst other advantages, led to the revival and greater use of those weeping standards, which previously had been confined almost entirely to the white varieties.

The crosses of the Wichuraiana with the Teas have produced yet another race, flowering earlier and giving us combinations of colour at once charming and distinct. Among this earlier blooming race one of the most beautiful is 'Jersey Beauty,' with its large, delicate, single flowers and evergreen foliage. I have been fortunate enough to secure some seedlings from it, possessing in a considerable extent the same desirable characteristics. Among these are 'Ariel,' a cross between 'Jersey Beauty' and 'Tea Rambler,' and 'Shower of Gold,' a cross between 'Jersey Beauty' and a yellow hybrid Tea. Recollecting that 'Jersey Beauty' has already Tea blood in its veins, it is not surprising that some of the seedlings from the latter cross have lost their climbing habit, although retaining the beautiful foliage of the Wichuraianas. A similar thing occurred earlier with the Multifloras, which produced a race of Pompom roses, now greatly developed, from Rose 'Pacquerette,' and gave us the best roses for edging our borders.

It will be seen how largely the influence of *Rosa Wichuraiana* enters into our modern rambling roses, and we begin to realize the common aim that hybridists have had in view, for if we examine the various crosses that have been made with Wichuraianas we see that they have nearly all been made with perpetual-flowering varieties, and so it is to be presumed that the ultimate end in view was to secure a race of perpetual-flowering ramblers. All the more singular is it, then, that while this end has not been attained to any great degree, other results, perhaps not so much expected, have been reached, for the Wichuraiana foliage has to a very large extent been retained, as have also its later blooming character, its comparative hardiness, and its habit of flowering upon the young wood. All these things have, even if they have not been directly worked for, added desirable qualities to our rambling roses, and it is apparent that even the perpetual-blooming tendency must be there, though at present dormant, and only needing to be brought to surface, so to speak, to give us an autumnal flowering race.

One or two present-day raisers of new roses, too, have been making wider experiments, and to this end have not contented themselves with working on one or two lines, but have thrown out feelers in other directions and with a certain amount of success. Among these names may be mentioned LAMBERT, of Trier, who, by working with the Musks and Noisettes, has obtained the best perpetual rambler up to date, 'Trier,' which, if a little deficient in colour, is a most distinct advance.

Now we must not forget that the early hybridists used the Musk-rose as seed-parent, although they did not carry their developments very far. 'Mme. d'Arblay,' already mentioned, 'Princesse de Nassau,' 'The Garland,' are all hybrids of the Musk. But the introduction of

the Noisette, which in its initial state was a hybrid of the Musk-rose, seems to have diverted the attention of the raisers of those times to this new class. These Noisettes gave us perpetual bloomers, but they also destroyed to a large extent the habit of the true rambler. 'Trier,' says Mr. LAMBERT, is a seedling from 'Rêve d'Or.' 'Rêve d'Or' is probably the most rambling of all the Noisettes, but it is in essence a true Musk, showing that it has harked back to the common ancestor. I have experimented to a considerable extent with the Musks and have raised a large number of seedlings therefrom, many of them continuous bloomers, but not more than semi-climbers; and the Musk race has another defect, which is that it does not always endure the winter frosts, and consequently is not altogether suitable for hybridizing purposes. Thus the stage of perpetual-flowering kinds has been reached, but the lack of hardiness and vigour has not yet been entirely eliminated.

By crossing the hybrid Multifloras with the Noisette 'Celine Forestier' I obtained some seedlings such as 'Goldfinch' and 'Starlight,' which have the vigour of the Multifloras but which still exhibit some trace of the Musk or Noisette tenderness, so that occasionally one will find upon plants of 'Goldfinch' and others black, unhealthy patches on the wood, showing the influence of the Musk blood.

We find, then, that the present state of rambling roses in our garden is roundly this:—

We have secured, undoubtedly, much improvement in them; we have good foliage, vigour, considerable hardiness, and we have, lying dormant, in the most modern varieties, a strong tendency towards the perpetual character. If we can combine the Multifloras, or even more so, the Wichuraianas with the Musks and the Noisettes, we may, with some hope of success, look forward to a race of true continual bloomers, and I believe we are on the eve of a great advance with rambling roses and that we shall shortly bring them into line with those beautiful dwarf decorative roses that furnish our rose-beds with such lovely colours in the autumn.

Yet it is curious to observe how, among the great number of rose species, the comparatively few there are that have been used by hybridists to gain variety. *R. rugosa* has been used, but has hardly been carried beyond the first or second stage. There is another species, *R. humilis*, which flowers in the autumn, and yet I know of only one hybrid from it—a hybrid with *rugosa*—one of the freest autumn-flowering varieties we have. One cannot help thinking that here is an opportunity for amateurs for original work and research, because professional rose growers are bound to a large extent to study the demands of their clients and have neither the time nor the opportunity to make these first crosses, which often bring about at last the most distinct changes in rose growing. I suggest that some of our amateurs should make tentative crosses between the species and give us some novel creation that would help to procure a new race of garden hybrids.

There is a point of some interest to which we may briefly allude. It is well known that the many species of wild roses ar-

divided into some nineteen or so groups following their botanical affinities, and it is worthy of observation that substantially all the parents of our ramblers belong to one only of these groups. *R. multiflora*, *R. Wichuraiana*, *R. moschata*, *R. arvensis*, and *R. sempervirens* are all allied and have all been used largely. *R. setigera*, the one American kind belonging to the group, has been used to some slight extent. More extension into other groups is needful, and with care and patience some unthought-of results will repay the workers on these lines.

LIFE A DIRECTOR OF FORCE IN THE DEVELOPMENT AND EVOLUTION OF PLANTS.

By Rev. Professor G. Henslow, M.A., V.M.H.

[Read October 25, 1910.]

It was customary formerly to describe life as a "Vital Force," but the inadequacy of the expression has been recognized and the term abandoned. It was, I believe, Mr. James Croll who first drew attention to the question forming the title of his pamphlet, "What Determines Molecular Motion? The Fundamental Problem of Nature."* The fact is that the world is only composed of various kinds of *matter*—made of the eighty or so elements, every one of which is of itself lifeless and inert—and *force*, and no force can *direct itself* or *purposely* bring about molecular motion or any other movements of matter.

Force in action requires *something* to direct it. Thus a stone falls perpendicularly to the ground under the direction of gravity. Elements combine to make compounds under the direction of what is called chemical affinity; but no one knows why it is so, or the source of this directivity.

One thing is observable, and that is, in the inorganic world such directions are constant and always the same. The molecules of a crystal are so placed as always to make the same angles, whether to-day or millions of years ago. Gravity has never altered. But when we come to living beings it is very different, as I propose showing; but whence came the first living being?

One of the simplest forms of living plants may be seen in the zoospores, or propagative bodies of some green sea-weed, as the common *Ulva*, or laver. They consist of living protoplasm without any cell-wall encasing and protecting it. After they settle down, cell-walls of cellulose are secreted by the protoplasm. Such, then, may be regarded as probably being something like the first living plant on the earth. But how did life arise? †

This question demands a previous one. How was protoplasm formed? Most substances are compounds with comparatively few parts or atoms of each element; thus water is H_2O, sugar $C_{12}H_{22}O_{11}$; but the *approximate* analysis of albumen, which is akin to protoplasm, is $C_{60}H_{100}N_{16}O_{20}$, protoplasm requiring sulphur and, in its all-important nucleus, phosphorus. Whence came these elements *together*; and why did they *unite* in the proper proportions to make protoplasm?

* *Philosophical Magazine*, July, 1872.

† For further considerations about this, the reader is referred to my *Present-day Rationalism Critically Examined*, chaps. iv., v., pp. 28 ff.

And then, again, how did this substance, once formed, become *alive*? "Directivity" * appears to have been at work.

Now the word "directivity" may be widely extended. It not only covers such vegetable products as Sir A. H. Church alludes to, but all others which cannot as yet be made in the laboratory; and protoplasm is the most important of all. To make the first atom of protoplasm, directivity from some unknown source must have been present. Was there a pre-existent life *without* protoplasm, which directed the elements to combine to make it for all future organisms?

But as far as we can judge, the first living being must have been a green vegetable of a very simple kind; for no colourless plants, such as microbes or animals, can live on mineral matters.

The word "mineral" includes all three conditions—the solid, the liquid, and the gaseous; but *living* matter is always solid. We are now concerned only with the directivity in the latter.

Let us, then, consider the machinery by which life in plants can direct the forces which move matter in their construction.

The roots absorb water wherein is dissolved necessary mineral salts, forming the ash when the plant is burnt. The stem conveys this water to the leaves. The leaves get rid of much of the water in the form of vapour; they are also recipients of gaseous food (CO_2, or carbonic acid gas). They then digest and assimilate the carbon. The first *visible* organic product, made under the directivity of life, is starch; but in order to avoid its accumulation in the leaves it is converted into soluble sugar, and soon conveyed away to places where growth is going on, or else to be stored up again, re-formed as starch in tubers and seeds.

The "elaborated sap," containing, like blood, the nourishing matters, then passes back into the trunk and branches and down into the roots; so that every part of the plant can *grow*. All the above "movements of matter," or "molecular motions," are done under the directivity of life governing the energy displayed. Nothing of the sort exists in the inorganic or mineral kingdom. A crystal is often described as "growing," but its increase in size is only by superficial accretions of the same kind of matter.

Moreover, life governs many of the chemical changes which take place. Thus various substances, especially carbonic acid and nitrates, are absorbed by the leaves and roots respectively, are decomposed, and their elements reunited to form "organic" compounds, which have never been found outside a living being. It was this fact, as stated, which suggested the word "directivity" to Sir A. H. Church.

* I am indebted to Sir A. H. Church, F.R.S., for this very useful and expressive word, "Directivity." He wrote me: "I coined it many years ago to avoid the use of 'force,' 'energy,' &c., when describing in lectures on organic chemistry the parallelism between the chemist *directing* in his laboratory physico-chemical forces in the making of a true organic compound and that mysterious 'something' which employs the same forces to make the same compound in the plant or animal."

Not only does life make them, but *locates* them when made in their respective positions where required. Thus, our food is digested and becomes blood, which traverses the entire person, nourishing even the most minute portion of the body. Like a railway train which stops to deposit parcels *directed* to various stations, so lime is chiefly deposited by the blood where bones are formed and in the teeth. Silica is sent to the hair, nails, and teeth, fluorine being also in the bones, as well as the teeth, to make the enamel. Salt is carried to the tears, but not to the mouth. Phosphorus is wanted in the bones and brain, &c.

Similarly in plants, sugar is made in fruits, starch is laid up in seeds and tubers, oil is found in seeds; while silica is deposited in the surface of all grass-stems. Thus we see directivity everywhere at work. Vegetable products are thus found to be located in definite *cells* suitable for the purpose. Moreover, cells are of all sorts of shapes and sizes, according to the uses for which they are required. Thus in cork they are roughly cubical; in fibrous bark, such as makes tow and flax, or shreds of a vine-stem or that of a Clematis, the cells are of very great length, tough and flexible, tapering to a point at each end; while wood-cells or fibres are short, very thick-walled and firm, for supportive purposes.

On the surface of a leaf they are colourless and flat, conjointly making a skin or epidermis. Just below that of the upper surface, the cells are rather long and compactly pressed together: hence they have been called "palisade" cells. It is these which make a leaf green, for they abound with chorophyll granules. Vessels * composed of rows of cells, with the partition-walls absorbed, become thickened in various ways by spiral or circular bands, &c. These tubes are for the more rapid conveyance of water.

In all these cases the thickening is the result of response to strains, stresses, and weights; so that if stems be artificially bent, the supportive tissues increase accordingly in quantity to meet the strain.

If we ask *why* the cell-walls thicken in this way, we can only say that the material, as cellulose, is secreted by the protoplasm, the life of which *directs* the energy, which places the molecules of cellulose in such a way as to form a spiral or whatever character the thickening may assume.

Such are a few of the many sorts of plant-cells, each being regularly found in its proper place, and all having some definite use for the plant's requirements.

How came all this about? What determined these various tissues to be constructed as, and where, we find them? We must go deeper into the matter; for all cells begin alike, and are very minute, mostly quite invisible to the naked eye. But as they grow larger they take on the various forms and structures required, wherever their locality in the plant may be.

* Easily seen in a piece of oak-wood, looking like pinholes in a surface cut across the grain.

Let the reader examine a living cell in the earliest, or embryonic, stage.*

The questions which concern us here are—as the chemical substances of the parts of a nucleus have no power to move or direct themselves—Whence comes the energy and directivity which compel the granules of protoplasm to form polar star-like bodies? What makes the matter of the chromosomes to form a chain? Why does the chain break into a constant number of V-shaped parts? Why should they double the number by splitting in halves? What guides them to travel in opposite directions along the spindle-lines? When they arrive at the poles, what compels them to unite and form the daughter nuclei? Why is all this complicated process necessary in order to make two nuclei out of one?

Then, lastly, what directs the energy which makes the cellulose build up very differently shaped cells in various places just as they are required?

Such are but a few questions which suggest themselves; but remembering that protoplasm and the chromosomes of the nucleus consist of the elements C, O, H, N, S, and P, and that neither these nor their compounds have any power of self-movement or self-direction, we are driven to the conclusion that *life is the director of energy*, and acts just as if it were *conscious* of what it is about, having in view the ultimate forms of cells and the localities where they are to be made. As long as any species of plant lives, generation after generation, under the same external conditions of life, the same processes of growth and development and the production of organic substances go on year after year.

But let us suppose the seeds of a plant find themselves in some locality differently constituted in certain ways—by being much drier or moister, or the temperature on the average higher or lower than that to which the species had been accustomed—what happens? If the change is too great the seedling perishes; but as a rule plants can stand a considerable amount of differences. That being the case, the seed germinates, and the plantlet begins to "feel" the effects of what Darwin called the 'direct action of the changed conditions of life." It *responds* to them, and, under directivity, it begins to build up new tissues, by making cells to suit the new experiences.

Thus, if an ordinary terrestrial plant grows up in water, and consequently no longer requires the old supportive tissues of the stem, necessary when the plant grew on land in the air, these cease to be formed, as the water now supports it. As the epidermis is no longer required, that, too, fails to appear. We may call such changes "degenerations," but the plant thereby becomes adapted to an aquatic life instead of an aërial one.

Conversely, if a plant has to live, if it can, in a desert, it must store up water against a prolonged dry season and prevent the loss by tran-

* The whole process of cell-division, or "karyokinesis," is to be found described in any good text-book.

spiration; so its stems often acquire huge dimensions, being made of a thin-walled, succulent tissue, as seen in Cacti, Euphorbias, Stapelias, &c., with a very thick skin to arrest the loss of water. There being an insufficient supply of water, the size of the leaves is reduced; while boughs often remain short and harden, often ending in spines, as in our Furze.

Not only is it a matter of *induction*, or the accumulation of innumerable independent cases, where the same results follow under similar conditions—as those of Mexico for Cacti and Agaves, and of Africa for Euphorbias and Aloes—but an abundance of experimental proof is afforded. Thus, if spiny plants are grown with plenty of water, the spines grow out into leafy branches, as in the Rest Harrow and Furze. The fleshy plants of the seaside, as the Samphire, can be imitated by watering cress or other inland plants with salt and water, and they become fleshy too. Dwarf alpine plants may become tall in low altitudes, and lowland ones become dwarfs when grown high up, and so on.

In every case the non-living materials, as cellulose, necessary for building up the plant, must be directed to the places required by the living protoplasm.

With regard to the question before us—Whence came this responsive power in all living beings to vary structures so as to become adapted to changed conditions of life? It resides in the protoplasm and nucleus. In other words, it is a property of life; and saying that is saying all we know and are likely to discover from Nature.

It is a matter of common experience that architects and engineers so far "follow Nature" knowingly or unconsciously by adopting precisely the same mechanical methods as are to be found in organic beings, and for the same purposes. Thus the wood of stems constitutes a number of girders; and when they unite into a tube the stem may become hollow, as is a straw; but then cross-diaphragms are inserted at the joints, just as a hollow iron pillar is provided with them where necessary for strength. Cables are made of several spirally twisted ropes; some lianes are similarly constructed.

If man, therefore, constructs all sorts of mechanical appliances to meet the necessities of his work, so do plants and animals. These both feel strains, stresses, and weights, and consequently set to work to meet and overcome them.

All this is done under the directivity of life.

If, then, induction be trustworthy, the above brings us to the inevitable conclusion that it is life which is the director of energy in all organic beings.

PLANTS IN CONGENIAL POSITIONS.

By Jas. Hudson, V.M.H.

[Read November 22, 1910.]

In dealing with this subject I am, to a considerable degree, doing what is being continuously done by the Horticultural Press. Illustrations are frequently appearing there depicting the successful cultivation and use of plants, but now I wish to refer to some instances which have come directly under my own observation. It matters not into what garden we may go, be it great or small, there is almost always something to be learned, generally of what may be done, sometimes of what to avoid. The successful results met with may be the outcome, to some degree, of climatic conditions, but it is, I think, more often the combination of common-sense cultivation with favourable climatic conditions that leads to success.

In travelling along a portion of the northern coastline of the Mediterranean Sea many instances are seen of the successful placing of plants, and some, too, where success has been obtained with little apparent effort on the part of the cultivator. I refer more particularly to the huge masses of the Ivy-leaved Pelargonium, in some instances from 8 to 10 feet in length, hanging down from the rocks above them, which when in flower are a charming sight. So, too, are the dense masses of *Mesembryanthemum edule*, which appear to take root wherever they are placed, and in the spring are very beautiful. Again, the Bougainvillaeas upon the houses at Monte Carlo and elsewhere are surpassingly fine when in flower. More care is needed, no doubt, with the grand specimens of Oranges and Citrons along the same coast. Both in Lord Rendel's gardens at Antibes, and at La Mortola, the late Sir Thomas Hanbury's celebrated garden, a large number are grown which are monuments of skilful cultivation. The Palms along the same coast are evidently quite at home; so are the Bamboos. The last are even finer, I think, on the Lake of Como, around Bellagio, where many stems more than 9 inches in circumference at 4 feet from the ground may be seen.

Nearer home we have, as most of us know, some fine examples of Rhododendrons in Cornwall, and many splendid specimens of other flowering plants, such as we rarely see elsewhere; *Crinodendron Hookeri* and *Embothrium coccineum* are notable. The last-named grows finely in Lord Falmouth's garden at Tregothnan, where the Camellias on the walls are worth a journey to see. In the ravine at Heligan Mr. J. Tremayne has Bamboos and other beautiful shrubs growing luxuriantly. At Caerhays Castle, the home of Mr. J. C. Williams, there is a host of choice things to be seen—Lapagerias, for instance, on the open wall, facing north: and not the least noticeable.

the fine masses of *Cyclamen hederaefolium*, quite at home under the fir trees. All of these speak eloquently of congenial surroundings taken due advantage of, and success has followed.

If we turn to Ireland we find other examples well worthy of notice. For instance, probably the finest example of *Gunnera manicata* in the United Kingdom grows at Narrowater Castle, Co. Down, the seat of Captain Hall. (Fig. 160.) Mr. Morrison, the gardener, has courteously supplied me with notes of its size. In full leaf its height is 10 feet 6 inches, its circumference 106 feet, its largest leaf 8 feet 9 inches in diameter. The plant was first planted in 1885, and has been many times divided since. It is mulched heavily every spring with farmyard manure, and the overflow of a pond above the plant supplies moisture. At Castlewellan the Countess of Annesley grows many choice Conifers, and probably the finest examples to be found of that choice shrub *Desfontainea spinosa*, which there forms really huge bushes. The requirements of this plant are fully met there, shelter being one of them, but shelter without shade. Mr. Ryan may well have been proud of them.

At Straffan, Co. Kildare, Mr. Barron's home, there are several choice things, notably *Cypripedium spectabile* in large masses, the finest of the Snowdrops, too, in profusion, and the Narcissi in thousands. There also, upon an island in the Liffey, are some immense plants of Bamboos; these are at times flooded when the river is high. Mr. Bedford has to contend at Straffan with severe frosts, which to many would be a deterrent of successful culture.

The finest plant that I have ever seen of *Romneya Coulteri* was at The Pleasaunce, Overstrand, near Cromer. The late Lord Battersea had first to provide a shelter before any attempt at growing choice plants could be made. The place had to be made congenial.

It is well known that *Tropaeolum speciosum* will not thrive everywhere. I think the best I ever saw was at the Plâs, Tan-y-Bwlch, in North Wales. Mr. Roberts, the gardener there, had at first a difficulty in making it grow; now it is in profusion.

In the R.H.S. Gardens at Wisley we have some noteworthy examples. The large *Gunnera manicata* by the pond is well known, and well placed, too; it no doubt receives a deal of moisture from the higher ground behind it. A very effective grouping of this plant and some of the best of the Bamboos has been made at Wisley. The two together form a good example of planting, which in combination with water would be most effective. Bamboos are quite at home at Wisley, and so are the hardy Primulas, and we hope in the near future to see the newer and recently introduced species thriving well there, too. Wisley, like many other successful gardens, is liable to frost, hence we must not say any garden is not suitable for growing choice plants because of its liability to frost. Wisley calls to mind, too, the success achieved with *Lilium giganteum*, a somewhat fractious subject anywhere.

One almost always associates the Iris with water scenery. A wonderful combination is thus afforded at Mr. Bowles' garden at

Myddelton House, Waltham Cross, where only a narrow grass walk intervenes between the Irises and the river. In the near future we shall see many of the newer introductions from China thriving well at Aldenham House, under the fostering care of the Hon. Vicary Gibbs, and his gardener, Mr. E. Beckett.

Given the one most essential factor in all successful gardening—viz. shelter—much may be accomplished.

The following notes deal with the special treatment of some plants which have come directly under my own notice:—

Senecio clivorum.—This strong-growing herbaceous perennial, introduced from China by Messrs. Jas. Veitch, has become a great favourite. When I first planted it I arranged it as a margin to taller plants next to a lake, but I thought I could succeed better with it if it were planted quite independently of everything else. Feeling sure that it was a great lover of moisture, I decided to make an island for it. In doing this I brought the level up to the waterline with old bricks, and finished off with some coarse ashes. On this I placed the soil up to about 1 foot in height, and then planted my stock. The improvement has been manifest in more robust growth and stronger flower-stems. This growth clothes the soil down to the water's-edge, and all the moisture needed is drawn upwards by the roots. Thus grown, *Senecio clivorum* has a fine effect. It should not be planted where the roots of trees or of other strong-growing plants can rob it of its due proportion of moisture. If a situation can be chosen where a little shade from the midday sun can be secured during hot weather it will be all the better.

Artemisia lactiflora.—This Artemisia is one of the finest hardy border flowers we have. Its Spiraea-like, much-branched panicles of fragrant white flowers produce a charming effect in the late autumn. I find that this, too, delights in abundance of water at all periods of growth. Even when in flower it ought not to suffer, otherwise its beauty will pass away all too quickly. It should be given a damp, somewhat shaded position if possible. On no account plant it on a dry border or where it would be overcrowded. A large mass of it is better for effect than a few plants. The stools should be divided at least every other year, in order to maintain a vigorous and floriferous growth. This, like the preceding, is an introduction from China by Messrs. J. Veitch.

Androsace lanuginosa.—This Androsace is one of the prettiest of all rockwork plants, where it thrives and flowers freely. The mass I have in view is planted about 1 foot above the level, and is in the full blaze of the sun almost all day. The soil is a good fibrous loam, and a fair amount of water is afforded, but not an excess. It flowers freely nearly all the summer through. During the winter the stools are protected by glass to keep off any excess of moisture. The extremities of the shoots die back, but the plants always winter well. It ought never to be overcrowded by any other growth. Cuttings strike during the summer if inserted near to a piece of stone and in the open.

Cimicifuga japonica.—Respecting the name of this plant there is, it appears, some uncertainty. I believe I am correct in calling it *C. japonica;* with me it is more graceful in growth than *C. simplex*. It is at its best during October, when it forms quite an attractive feature. I find it to be quite at home where I am now growing it, in partial shade, but not under the drip of trees be it noted. We have it growing in a group of considerable size and near to the waterside. It thrives best in a light peaty soil with me.

Gerbera Jamesoni.—About seven years ago I had twenty-four plants sent to me. Of this number I have still seventeen doing well. I experimented with four, planting them upon our old wall, but these died in the first season, during the winter of course. The bed in which the others are now doing well is about 10 inches above the pathway. During the season we have numbers of flowers on each plant, and often ripen a good amount of seed, which germinates freely. We use a light fibrous loam, top-dressing each spring. During the winter a light covering is fixed over and in front of the bed to ward off in some measure any injury from severe frost, while over the soil between the plants a covering of fine ashes is spread, about 3 or 4 inches in thickness. With a slight protection such as this it is possible to keep this pretty and popular plant through our average winters. I should add that this bed of *Gerbera Jamesoni* is situated at the foot of one of the glass structures; a slight shelter is thereby afforded. Another bed removed from this shelter is protected with frames during the winter, well-established plants keeping satisfactorily.

Gnaphalium Leontopodium ('Edelweiss').—This grows with the Gerberas; it thrives well, and is a very pretty feature in its season. I have been rather surprised to find how well the Edelweiss succeeds within the radius of the London fog.

The Wichuraiana Rose.—Rose-growers are well acquainted with the prostrate habit of the Wichuraiana Rose. Knowing this I planted several of the hybrids raised therefrom upon the top of our old wall. This was more than seven years ago, and the plants still thrive well, flowering in their season most profusely. The variety 'Gardenia' is a semi-double pale yellow one, and one of the prettiest of all in my opinion. Its growth even is very handsome, with its bright shining leaves. 'Dorothy Perkins,' 'Hiawatha,' 'Jersey Beauty,' and 'Evergreen Gem' are all suited to this system of cultivation.

Menziesia (*Daboecia*) *polifolia vars.*—It is pleasing to note that these and others of the Heath family are now being more extensively planted than formerly obtained. I think, however, that the Irish Heath is worthy of much more extended cultivation. To see either variety at its best it is better to plant in masses. In the case of the English Heather it is possible to plant upon slopes and in conjunction with rockwork, and good effect may thus be produced, but with the Irish Heath it is somewhat different, so far as my experience goes. I prefer to plant the latter nearly on the flat in order to secure all the advantage possible from rainfall.

Nicotiana affinis (Sander's hybrids).—I have introduced this example to emphasize the advantages gained by not overcrowding this and kindred plants. If we were to allow more room for after-development of all free-growing and spreading plants a far better effect would ultimately be attained, a smaller number of plants required, and labour would be saved.

Polygonum compactum.—We are indebted to many of the Knot-weeds for garden effect. The species named is more compact in growth than many. It flowers in great profusion at Gunnersbury, where its contiguity to the water adds to the effect from the opposite side of the lake. It is at its best during October, and lasts some time in good condition. It is valuable for grouping, being quite rigid in growth, and therefore needs no staking. The flowers are well displayed above the foliage. Its habit of growth indicates, I think, that it will thrive with a lesser degree of moisture than most of the species. While I am alluding to this genus I should like to draw attention to the much-neglected—and, may I say, somewhat despised?—*Polygonum orientale*, the 'Persicaire' of the French catalogues. It is valuable during the autumn months on the hardy-plant border. Of it there are two distinct forms—one with deep ruby-red flowers and racemes; and another, not so good in my opinion, with white flowers. It is easily raised from seed every spring, my plan being to let the seed drop in the autumn and to seek for the seedlings on the same spot in the spring. This *Polygonum* prefers a sunny and open position.

Crocus speciosus.—Of all the autumnal species of Crocus, this is, I consider, one of the very best (fig. 161). Its deep bright blue flowers are freely produced. Being one of those species whose foliage is produced only in the spring, it is needful to provide for the support of the rather slender flower-stems. I find it a good plan to sow grass-seed as soon as the bulbs are planted early in August; then by the time the flowers appear in late September or early October this grass will help to support them and add to the effect. If the bulbs are dibbled into grass, which can easily be done, no mowing should be allowed until the Crocus foliage dies down in the spring. Two other good autumn-flowering species are *C. cancellatus* and *C. zonatus*. I find these autumn Crocuses thrive well in dry positions for several years.

Calceolaria × 'Golden Glory.'—This hybrid Calceolaria is more effective, I think, when treated as a rockwork plant than when grown with other plants, or upon the level. It has survived one winter out of three upon the rockwork in question. It will flower most profusely through the summer with a fair amount of moisture and its roots cool amongst the stones. Its foliage, though somewhat large, lies close upon the soil. We are indebted to Messrs. Robert Veitch, of Exeter, for its production. It can easily be kept through the winter in a cold frame, where it is not found to be perfectly hardy, and it is easy to increase from root division.

Funkias.—This group of plants should receive more attention from

lovers of hardy plants than is accorded them. In the early spring their foliage is most beautiful and varied, in tints of green and golden and silver variegations. Some of the golden forms are quite lovely in their young growth. So also is *Funkia Sieboldiana*, with its glaucous foliage suffused with a metallic-blue shading. *Funkia subcordata grandiflora* has large foliage and pure white flowers produced late in the season. I find all thrive well by the margin of small pools of water. *Funkia Sieboldiana* requires complete shade, otherwise its foliage will be burned in bright sunshine. Nearly all the species have blue flowers, which make quite a display, chiefly in August.

Chrysanthemums in September and October.—The decorative qualities of the Chrysanthemum are well known to us all during November and December. But for September and October I think more may be made of them for out-of-door uses in pots. They are grown, and that freely, in the open borders during these two months, and many valuable varieties are now cultivated for that purpose. I refer now more particularly to pot-grown plants, both of the dwarf bush varieties and those that produce large flowers. Grown in this way, I find them extremely useful for grouping in terrace decorations and the like. They last well, and, by selecting suitable colours, may be made to blend with the autumnal tints of the foliage about them. Some we group amid Japanese Acers, and others around a white marble seat. The varieties are almost too numerous to mention, but both the bronze and the yellow forms of 'Soleil d'Octobre' should certainly be grown for large flowers.

Annuals.—It is somewhat difficult to deal with annuals, on the whole, in association with set flower-bed designs, or upon what are designated hardy herbaceous borders. In either case there can scarcely fail to be a break or failure at some time or another during the season. To obviate this a plot might be set apart, quite by itself, for annuals in particular. I find this to work very well in practice. In our case the annuals are not kept trimmed or within certain limits, but are given room for freedom of growth. Thus grown they are very attractive, forming quite a feature, as well as a welcome change from the other parts of the garden. In our case we have to aim at a good display in the autumn; hence selections are made chiefly for that purpose. Bulbs could follow annuals very well indeed for spring decoration.

Convolvulus major.—Having to do something to hide the lamp-posts skirting a carriage drive, I adopted the plan of growing *Convolvulus major* up some strings strained tightly from bottom to top. I have found this method to answer very well. A profusion of flowers is maintained through the season, and even before flowers are freely produced the foliage is in itself very pretty. We endeavour to keep the colours separate.

Bamboos, *Arundinaria nitida.*—This species of *Arundinaria* has not, I think, received its full share of recognition. It is one of the prettiest and most graceful Bamboos in cultivation and as hardy as any, if not the

FIG. 160.—GUNNERA MANICATA AT NARROWATER CASTLE, CO. DOWN.

(*To face page* 544.)

Fig. 161.—Crocus speciosus at Gunnersbury House.

Fig. 162.—Nymphaeas and Richardias at Gunnersbury House.

hardiest of all. At least, this is my experience, now extending over several years. Our largest specimen of it has been ten years in its present position, and it measures 10 feet in height and 15 feet in diameter. It is nearly deciduous, casting the greater proportion of its leaves in March and April; hence the young foliage and growth come away somewhat earlier and quite freely. The first season the canes are erect, the second rather inclined to droop at the extremities, and the third quite pendulous. The increased amount of foliage explains this. The specimen in question faces towards the north and inclines over the water. Near to it and in the water is the Canadian rice plant (*Zizania aquatica*), whilst on one side is *Rheum palmatum* and in the foreground appears *Nymphaea Gladstoniana*. I find that most of our Bamboos thrive best near the water. One specimen of *Phyllostachys Castillonis* partially overhanging the water is most robust, now some 12 feet in height, with a spread of 10 feet. This Bamboo will be more planted as its merits become better known. It is, with us, one of the hardiest. *Bambusa japonica* also does well near the waterside. Our specimen has weathered all the frosts and storms of more than thirty years. Another species, similarly situated, *Phyllostachys nigra*, throve surprisingly well; but, alas! it flowered at last and has now disappeared. In the treatment of Bamboos I consider that we have to aim at a firm and sturdy growth—a growth that has a better chance of withstanding the rigours of our winters. The Bamboo belongs to the natural family *Graminaceae*, and to this family also belong the wheat, the oat, &c. The best straw from both wheat and oats comes from land where lime is present building up and solidifying the straw. So it acts, in my opinion, in the case of the Bamboo. Hence, the harder the growth, even though not quite so large, the better the prospect of withstanding winter frosts. The moral is—Do not manure too freely with nitrogenous manures, but depend rather upon bone-meal or its equivalent in another form. This is the plan I adopt, and I find it succeeds admirably. We usually apply a dressing in the spring, and if moving any, we mulch with farmyard or stable manure. Bamboos, too, require much more water than most cultivators imagine, and it is my opinion also that they will suffer more in cold, frosty weather and when keen winds prevail if they are at all on the dry side.

Dimorphanthus mandschuricus albo-variegatus.—Quite a different treatment, in one respect, should be accorded this plant from that given to *D. m. aureo-variegatus*. The former delights in shade, and the latter in full sunshine. This is the case with nearly all variegated plants. Enough emphasis is not placed upon this fact, hence failures occur—*e.g.* the 'Golden Privet' and the 'Golden Yew' are failures in the shade, as we all know. Again, *Bambusa Fortunei variegata* develops its silver-marked foliage much better in the shade, whilst *Arundinaria auricoma* in such a position always has a sickly appearance. I planted the Dimorphanthus on the northern side of some tall trees which screen it from the sun, and it thrives there remarkably well, producing large leaves with well-developed leaflets. Put the same plant in the

sun and the silvery variegation is scarcely seen at all, while the individual leaflets are curled and out of shape. It has been said that there is a good, as well as an inferior variety, of this plant. In my opinion, however, it is only a question of position, and nothing else.

Gunnera manicata.—For imposing effect in the garden this Gunnera has not, I think, an equal. It has its likes and dislikes as regards position and surroundings. Both spring frosts and wind have to be reckoned with, and even then it is caught by the spring frosts. It has also a great partiality for water, is at the same time a gross feeder, and requires quite a different treatment from that accorded to Bamboos and Palms. There is no enduring growth to build up here, but it needs food such as can be rapidly assimilated. The best plant that we have is growing close to the waterside, but it does not receive any supply from higher ground behind it, as I should like it to obtain. The effect by the waterside is quite in keeping with the Water Lilies and *Acorus Calamus*.

Trachycarpus excelsus.—I shall only deal with this one Palm, as no others can be considered hardy except in the most favoured spots in the United Kingdom. The case of *Trachycarpus excelsus* is different, and I quite think that it might be planted far more extensively than is at present the case. The chief factor in successful growth is shelter from keen, cutting winds. Given this it will withstand very severe frosts indeed; in fact, anything down to zero. We have several plants doing well, but all are in some degree sheltered from our worst winds—north, north-east, and east. No protection is given them in the winter by temporary screens or otherwise, yet we do not get the foliage lacerated by the winds. Some plants stand singly, others in groups. These have been planted nearly ten years, and not one has succumbed. It is a pretty sight to see them in the winter with a covering of snow resting upon the leaves. Water is freely applied. I would not even in the winter have them suffer from drought. We treat them like the Bamboos with respect to artificial feeding.

Iris xiphioides (the English Iris).—This species of Iris is well worthy of extended culture. It is a few weeks later, it is true, than *Iris xiphium*, the Spanish Iris. It is, however, finer in every respect, and it lasts even longer in flower, I think. It has done well with me in the flower-bed and also beside the lake, where I find it is quite appropriate and in keeping with the Water Lilies. The grass by the lake side is not cut, so the foliage of the Iris is not disturbed. These Iris should, like the Daffodil, be planted early in the autumn, and will last in good condition without being disturbed for three or four years.

Richardia africana.—This plant is, to all intents and purposes, hardy so long as its tubers are not frozen. I have had it now for at least eight seasons in the lake without disturbing it. True, it does not increase to any extent, but it grows and flowers well. It is planted upon the sunny side, where most warmth and light can be had. It is in congenial surroundings, with *Typha latifolia* as a background and Water Lilies in the foreground (fig. 162).

Nymphaea stellata and other Aquatics.—My last example is of a warm-water tank in the open air. It is comparatively easy to grow Nymphaeas, such as *N. stellata* (fig. 163) and *N. pulcherrima*, in such a tank. Wherever a tank can be arranged within easy reach of the hot-water service in any glass structure, the connexions can be made, and the additional heating required is almost infinitesimal. In our case the connexion is made to the piping in a late vinery, where the junction comes at a workable level. In this tank we have kept *Nymphaea stellata* safe through the winter by not allowing the water to become frozen on the surface. Another plan is to lift the Nymphaeas before winter sets in, and then merely protect the pipes from frost. In such a case the tubers can be kept, like Caladium tubers, in sand in a warm house until the spring. The tank is thoroughly cleaned out and a fresh start made towards the end of April. The tubers are started early in March and put out in a growing state, with the water maintained at about 70° Fahr. By the end of May some flowers are expanding; thence onwards until mid-October there is a constant supply. I have counted as many as forty-five flowers expanded at the same time in this one tank. The fragrance is like that of violets. The particular variety grown is termed 'The Berlin' variety, and it is the finest form of *N. stellata* I have seen. I think that, without doubt, this is the 'Sacred Lotus' of the ancient Egyptians. I saw it faithfully depicted upon the walls in the Tomb of Mera at Memphis, in the Sakkara district, near Cairo, last November. This tomb dates back to some 3200 B.C. I saw it also well pictured in the collection at the Cairo Museum. Now, I am told on good authority, no plants of it can be found further north than Khartoum.

The tank in question is well protected from easterly winds, but open to the west. In it we usually have one or more plants of *Papyrus antiquorum*, and several near the edges of *Eichhornia crassipes*. Near to the tank on the land side *Primula capitata* thrives very well, usually flowering very freely. This Primula is difficult to winter with us, the fogs no doubt being the cause of failure. As a margin to the tank there are several plants of the silvery-grey tinted *Festuca glauca*. The Papyrus has, of course, to be wintered inside, but even then it is not an easy matter to keep it healthy, the cause of this no doubt being the change from outside to inside treatment. The moisture arising from the tank during the summer is quite congenial to the 'Marvel of Peru,' which flowers freely near to the tank.

Nymphaea pulcherrima.—In another tank we grow *Nymphaea pulcherrima* under similar conditions. This species has at the present time some flowers upon it, but not well developed, as the tank is not covered. If it were covered, a longer succession of flowers might be had. *N. pulcherrima* is of more robust constitution than *N. stellata* and partakes more of an evergreen habit of growth. If but one variety can be grown I recommend *Nymphaea pulcherrima*.

OBSERVATIONS ON THE BLOSSOMING OF OUR HARDY CULTIVATED FRUITS.

By Cecil H. Hooper, M.R.A.C.

[Read November 8, 1910.]

My object in making notes on the blossoming of fruits was to try to ascertain the critical point in the flowering period when the blossoms were most susceptible to frost, but during the three seasons I have kept careful note at Wye, Kent, little or no injury seems to have been done by frost; in 1909 and 1910, especially the latter, the shortage of plums, pears, and apples seems rather to be due to dull, cold, and rainy weather while the trees were in flower, than to frost. In 1908 the flowering-time was generally sunny and dry, and although there were slight frosts on two or more nights, the flowers being dry, little or no injury seemed to follow; in that year there was a good crop of all fruits.

The importance of insects in the transference of pollen from one flower to another has long been known, but it is only within the last twenty years that in growing apples and pears it has been found to be always advantageous and with some varieties absolutely necessary to have cross-pollination of different varieties in order to get satisfactory fruit crops. Pollination consists in the transference of pollen from the stamen to the stigma.

Self-pollination is the transference of pollen from the same flower, and in the case of fruit trees from a flower of the same plant or from other plants of the same variety.

Cross pollination in the case of fruits is the transference of pollen from one variety, for example, of apple to the stigma of another variety of apple; for the trees of one variety are for this purpose similar, having their origin in one single tree and not from different seeds as in most other plants.

Cob Nuts.

The cob and filbert nuts flower earliest in the year. In these the male and female flowers are separate though on the same tree; the catkins of the former shed their pollen and the little crimson stigma of the latter are ready to receive it from about the beginning of February to the end of March. Being wind-fertilized the pollen is very abundant, and dust-like in consistency; it is globular in shape with triangular facets. For nuts to be produced there needs to be plenty of catkins as well as the female or pistillate flowers; if there are no catkins on the trees I am told hazel boughs with catkins on, placed in the cob-nut trees, will supply the pollen. Single nut trees in a garden frequently do not bear fruit, whereas where there are many trees together they

appear to bear more regular and larger crops. The deficiency of crop in the former case is no doubt due to scarcity of pollen. Mr. Geo. Bunyard tells me that in order to supply pollen, growers often plant in different parts of the nut plantation a variety called 'Cosford,' which bears a large quantity of pollen.

Gooseberry.

The gooseberry is usually the next fruit after the cob to open flowers:—

Table A.—Dates of Flowering, &c., of Gooseberries.

—	Commenced to flower	Full flower	Completed flowering	Number of days in flower	Picking green began	Picking ripe began
1908	April 15	April 28	May 13	36	May 26	July 10
1909	April 10	April 26	May 3	24	May 25	?
1910	April 12	April 23	May 3	22	May 16	July 14

The bushes are in flower about four weeks on an average, and the fruit is ready to pick green about a month after the bush was in full flower. The flowers and leaves open about the same time, and different varieties appear to flower at nearly the same time. The flowers at the tips of the branches open last. The gooseberry is protandrous, *i.e.* the stamens shed their pollen before the stigmas of the same flower are in a suitable condition to receive it. The gooseberry flower is unable to pollinate itself, and therefore needs the pollen from another flower to be brought by insects in order to set fruit. The pollen of the gooseberry is globular and viscid.

Red Currant.

The red currant is usually the next fruit to blossom after the gooseberry commences, but it is not so uniform in its flowering as the latter, thus one bush may be in flower earlier than its neighbour, and the same way with the branches, one may be in full bloom while on another the flowers have not opened.

Table B.—Dates of Flowering, &c., of Red Currants at Wye.

—	Commenced to flower	Full flower	Completed flowering	Picking ripe began
1908	April 23	May 9 to 13	May 27	July 10
1909	April 19	April 29	May 21	July 12
1910	April 15	April 30	May 18	July 13

The red currant commences to flower before the leaves expand and is in flower about a month. The pollen is almost spherical and is similar in appearance to that of the gooseberry and black currant. It is adhesive and appears to be shed only during a short period compared

to the long time the flower is open. The stamens and pistil come to maturity simultaneously.

The variety 'Comet' this year commenced to flower a week before 'Raby Castle.'

Black Currant.

The black currant starts flowering next and is about a month in bloom.

Table C.—Dates of Flowering, &c., of Black Currants at Wye.

—	Commenced to flower	Full flower	Completed flowering	Picking ripe began
1908	May 4	May 13–14	May 18	July 15
1909	April 19	May 7	May 21	July 14
1910	April 16	May 6	May 21	July 5

In black currants the leaves are fully expanded before flowering commences; the stamens and pistil come to maturity simultaneously; the pollen of the black currant is plentiful, spherical in shape, very adhesive, clinging together in a mass; the flowers are visited plentifully by hive and humble bees.

When the night frosts occurred in 1908, the weather and flowers were dry, the blossoms did not appear to be at all injured, and the crop was very good, whereas if the flowers had been wet, it is probable the crop would have been ruined.

Messrs. G. W. Avery and W. B. Little this year in the plantations of the County Councils of Cumberland and Westmorland covered one bush each of gooseberry, red currant, and black currant with muslin to exclude hive bees and other insects. The gooseberries and currants around produced splendid crops, but the covered bushes failed to produce more than a few dwarf fruits in each case, proving the value of bees in pollination work, especially in unseasonable and changeable weather. (*See* also Journal R.H.S., vol. xxxv., p. 195.)

Plums.

The Japanese plums are the earliest to flower, coming into bloom a week before the earliest of the European varieties; this may account for their irregularity in fruiting here, although the flowers are very abundant; they remain in flower a long time (in 1908 for thirty-five days).

The following is the approximate length of time of the blossoming of European varieties:—

Table D.—Length of Flowering Time of European Plums.

—	Average of	Time in flower	In full bloom
1908	10 different varieties	17 days (11 to 24)	8½th day (7th to 10th)
1909	7 ,, ,,	18 days (15 to 24)	7th day (6th to 8th)
1910	8 ,, ,,	23 days (20 to 26)	7½th day (6th to 8th)

The average length of time in flower is nineteen days (see Table E), being in full bloom between the seventh and eighth days after commencing to flower. A single individual flower is about six days between the opening and the falling of the petals. The honey glands of the plum are situated at the bases of the petals near their place of insertion on the receptacle. Having but a single carpel, there is only one stigma. In plums the anthers and stigma mature simultaneously.*

The pollens of plum, cherry, apple, pear, strawberry, and raspberry are very similar and of much the same size (figs. 164, 165). In shape they resemble, when dry, a grain of wheat or date stone, but are transparent and, of course, minute, their surface is almost smooth, unlike the pollen grains of many other plants which often have spiny outgrowths or irregularities which must assist their adherence to the hairs on the bodies of insects.

Mr. W. O. Backhouse, of the John-Innes Horticultural Institution, Merton, Surrey, informs me that from his observations this year he concludes the different varieties of plums to be on the whole self-fertile; he finds hybrids, however, tend to be completely sterile, thus 'Rivers' Early Prolific' sets with its own pollen with the greatest difficulty, only setting nine plums out of as many thousand flowers; whereas 'Victoria' is completely self-fertile, the fruit having to be thinned in the covered branches. The 'Histon Apricot' plum, the blue bullace and the sloe, are all self-fertile.

The old 'Greengage' shows itself self-sterile, but when dusted with pollen of 'Early Rivers' the fruit had to be thinned; in like manner the pollen of the greengage on the 'Early Rivers' gave a good crop. Mr. C. Martin, of the Toddington Nursery Company, tells me that 'Rivers' Early Prolific' and 'Black Diamond,' when planted separately in large blocks, fruit badly, and the outside trees of the plantations produce more than those of the interior.

Taking an average from about twenty records in different parts of the country and in different years, the following gives the average order of blossoming of plums—

Early Blossoming Plums.	*Late Blossoming Plums.*
1. Japanese Plums.	12. 'Bradley's King of Damsons.'
2. 'Grand Duke.'	13. 'Sultan.'
3. 'Damascene.'	14. 'Oullins Golden Gage.'
4. 'Black Diamond.'	15. 'Jefferson.'
5. 'Prince of Wales.'	16. 'Farleigh Damson.'
6. 'Monarch.'	17. 'Cox's Emperor.'
7. 'Rivers' Early Prolific.'	18. 'Coe's Golden Drop.'
8. 'Greengage.'	19. 'Prune Damson.'
9. 'Victoria.'	20. 'White Bullace.'
10. 'Drooper.'	21. 'Pond's Seedling.'
11. 'Pershore Egg Plum.	22. 'Late Orleans.'
	23. 'Belle de Louvain.'

* *The Fertilisation of Flowers*, by Hermann Müller.

TABLE E.—AVERAGE DATE OF COMMENCEMENT, FULL BLOOM, AND DURATION OF PLUM BLOSSOMS AT WYE, KENT. FOR 1908, 1909, AND 1910.

Recorded by Cecil H. Hooper.

Variety	April														May																				Average Number of Days in Flower
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
'Burbank' (a Japanese plum)	×	×	✓	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×									29
'Grand Duke'				×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																	?
'Monarch'							×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×														18
'Old Greengage'									×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×						24
Black Diamond'									×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×											19
'Cox's Emperor'									×	×	×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×									21
'Cheshire Damson'										×	×	×	×	×	×	×	F	×	×	×	×	×																	13
'Bradley's King of Damsons'										×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×												18
'Victoria'										×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×													17
Coe's Golden Drop'										×	×	×	×	×	×	×	×	F	×	×	×	×	×																14
'Jefferson'										×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×				24
'Prince Englebert'											×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×										19
'Rivers' Early Prolific'											×	×	×	×	×	×	F	×	×	×	×	×	×	×	×														14
'Sultan'											×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×											17
'Czar'											×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×											17
'Oullins Golden Gage'												×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×							21
'Pond's Seedling'													×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×				22
Pershore'															×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×		23

Note.—The record is from first flower or flowers open till practically all petals have fallen. F = full flower.

1908. Average duration in flower of 9 varieties, $16\frac{1}{3}$ days. Full bloom on 8th day.
1909. „ „ „ 9 „ 18 „ „ „ 7th day.
1910. „ „ „ 8 „ $23\frac{5}{8}$ „ „ „ $9\frac{4}{7}$th day.

Mean . 19 days. Mean . 8th day.

* Blossoming time in 1908 sunny, crop good; in 1909 dull and cool, crop small; in 1910 dull, cold, and constant rain, crop small.

Of these some vary in their order of blossoming, notably 'Victoria'; among those constantly early may be mentioned the Japanese plums, 'Grand Duke,' 'Damascene,' and 'Black Diamond,' while among the last to flower in all records are 'Coe's Golden Drop' and 'Pond's Seedling.' In 1908 'Rivers' Early Prolific' was in flower only twelve days, whereas 'Monarch' was in flower twenty-four days.

As the total flowering period of the different varieties of plums is about twenty-five to thirty days and the average length of time of each variety in flower is about nineteen days at Wye and probably about the same for other parts of England, the earliest and latest flowering varieties have a considerable portion of their flowering periods overlapping, and this assists cross-pollination. Theory and practice seem to recommend the mixture of two or more varieties of plums in a plantation as being advantageous for cross-pollination, and that bees in the vicinity of a plantation are advantageous, especially in a wet season, as the bees come out to work during the fine intervals. It seems also advantageous to place hives of bees in different parts of a plantation, and I would suggest one hive to two acres of fruit plantation.

Cherries.

In 1909 cherries were in flower from April 21 to May 19, and the crop was exceptionally heavy. The different varieties were in flower an average of twenty-two days each, and in full flower about the seventh or eighth day after commencing (see Table F). Cherries of different varieties come into flower at very nearly the same time, 'May Duke' and 'Morello' being the latest. In 1909 the earliest and latest flowering varieties had fifteen days of simultaneous flowering. The fact of the different varieties being in flower at the same time must assist in cross-fertilization.

Cherries attract bees by their scent as well as by their honey and their white petals. Most cherries have their anthers and stigmas mature at the same time.

As to the importance of bees in pollinating cherry blossom, Mr. F. W. E. Shrivell, of Golden Green, Tonbridge, told me he had a large 'Bigarreau' cherry which bore good crops for many years while he had a hive of bees near, but on account of the bees getting "foulbrood," they were destroyed, and for three years there were hardly any cherries; since restarting the bees the cherries have been plentiful.

The order of flowering taken from three records seems to be somewhat as follows: 'Corone,' 'Rivers' Early Black,' 'Elton,' 'Black Tartarian,' 'Governor Wood,' 'Black Eagle,' 'Knight's Early Black,' 'Turk,' 'Bigarreau Napoleon,' 'Rivers' Bigarreau,' 'Waterloo,' 'Florence,' 'May Duke,' 'Morello.'

TABLE F.—BLOSSOMING DATES OF CHERRIES IN 1909 AT FAVERSHAM, KENT.

Recorded by F. Ivo Neame, Esq.

Variety	April										May																	
	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
'Corone' . .	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×							
'Early Rivers' .		×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×				
'Governor Wood'				×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×				
'Black Eagle' .					×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×				
'Knight's Early Black' . .					×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×			
'Turk' . .						×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×			
'Rivers' Bigarreau' . .							×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	
'Florence' . .								×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×

Note.—The record is from first flower or flowers open till practically all petals have fallen. F = in full bloom.
Average length of time from first flowers to petals fallen, 22 days.
Full bloom, average 7 to 8 days after commencing to flower.

Weather, 1909.—April 21–30, rather rainy, wind S.W., temperature medium.
May 1–15, quite fine, wind N.E., temperature medium.
May 16, rain.
May 17–24, moderately fine, cloudy, wind S.W., temperature above average.

In 1910, the average length of time in flower was 15 days; in full bloom between 5th and 6th.—In Capt. Chas. F. Hooper's orchards at Sheldwich, Faversham. Blossoming period extended from April 11 to May 19, and commenced with 'Adams' Crown,' and ended with 'Bigarreau Napoleon.' The cherry crop was very short, apparently on account of the small amount of sunshine and much rain during the flowering period.

Pears.

In most varieties of pear the leaves commence to unfurl and the flower buds open about the same time; in some kinds the leaves are almost unfurled before the flowers begin to open, while in others the leaves commence to unfurl only when the tree is in full flower.

The average flowering record at Wye is as follows:—

Table G.

—		Average length of time in flower	Average day in full flower
1908	15 varieties	15 days (varying between 10 and 18)	$5\frac{1}{3}$th day (varying 4th to 8th)
1909	15 „	18 days (15 to21)	8th day (7th to 9th)
1910	15 „	$23\frac{1}{2}$ days (18 to32)	11th day (5th to 17th)

The longer period in flower in 1910 was probably due to the sunless and rainy weather during which they were in flower.

At Wye the average length of time in flower is about eighteen days and of reaching full bloom the eighth day (see Table H).

The varieties 'Duchesse d'Angoulême' and 'Beurré Clairgeau' seem to be early on all records, while 'Doyenné du Comice' and 'Marie Louise d'Uccle' appear to be always among the last to commence to flower.

The following varieties of pear appear to be specially good pollen producers: 'Beurré Clairgeau,' 'Pitmaston Duchess,' 'Catillac,' 'Marie Louise d'Uccle,' 'Clapp's Favourite,' and 'Doyenné du Comice.'

In the pear the flower contains twenty stamens, the anthers being red, and a five-celled ovary with five styles and stigmas; the stigma is covered with small blunt papillæ, which form a sort of brush to catch and retain the pollen. During part of the life of the flower the stigma secretes a slightly sticky liquid which moistens its surface. The greenish disc in the centre of the flower is the nectary. Each cell of the ovary contains two ovules, making ten in all; these when properly fecundated may all develop into seeds. The pear flowers are borne in corymbose clusters, generally consisting of seven or eight buds, although the number may vary. In the pear the stamens are longer than the styles, but when the flower opens the stamens are curled inwards and are immature, while the stigmas are ripe and ready for pollination. Thus for artificial pollination one is able to choose buds nearly ready to open, pull off the petals, cut out the stamens, and pollinate the stigmas with any pollen chosen. Müller says cross-fertilization is insured only if insects come soon after the opening of the flower. In the absence of insects, self-fertilization may take place as in the apple; he frequently observed how easily pollen from a ripe stamen adheres to the stigmas of a flower long before its anthers are ripe. He records thirty-one different insects visiting pear flowers.

TABLE H.—AVERAGE DATE OF COMMENCEMENT, FULL BLOOM, AND DURATION OF PEAR BLOSSOMS AT WYE, KENT, FOR 1908, 1909, AND 1910.

Recorded by Cecil H. Hooper.

Variety	April							May																				Average Number of Days in Bloom
	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
'Beurré Clairgeau'	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×								22
'Duchesse d'Angoulême'	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×									20
'Beurré Diel'		×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×									20
'Marguerite Marrilat'		×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×										19
'Jargonelle'			×	×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×								19
'Williams' Bon Chrêtien'			×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×									18
'Beurré Hardy'			×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×								19
'Doyenné Boussoch'				×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×											16
'Beurré Giffard'				×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×							19
'Catillac'				×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×								18
'Pitmaston Duchess'					×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×						20
'Dr. Jules Guyot'					×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×									16
'Clapp's Favourite'					×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×							18
'Triomphe de Vienne'					×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×							18
'Souvenir du Congrés'					×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×							18
'Doyenné du Comice'							×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×		22
'Marie Louise d'Uccle'							×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×					18
'Durondeau'								×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×						17

Note.—The record is from first flower or flowers open till practically all petals have fallen. F = in full bloom.

Average length of time in flower in 1908 of 14 different varieties, 13 days. Full bloom on 4th to 5th day.

" " " 1909 " 18 " 18 " " " $8\frac{1}{2}$th day.

" " " 1910 " 20 " $23\frac{1}{2}$ " " " 11th day.

Mean . $18\frac{1}{4}$ days. Mean . 8th day.

The blossoming period in 1908 was bright and sunny, with good crop following in 1909, dull; 1910, dull cool with frequent rain, very small crop.

M. B. Waite, of the United States Department of Agriculture in 1891 and 1892, carried out most valuable experiments on "The pollination of pear flowers," which furnish repeated evidence of the value of cross-pollination in pears for fruit production. He found that out of thirty-six varieties tested twenty-two were self-sterile, and although a few varieties of pear were quite productive with their own pollen, yet even with these varieties self-pollination seemed to be less certain than cross-pollination and was less satisfactory some seasons than others. The results have shown that the varieties belong more or less distinctly to two classes—self-sterile and self-fertile. Absolute reliance should not be placed on the synopsis. The work was, however, duplicated several times and repeated in four different places with the same general result.

I.—PEARS MORE OR LESS COMPLETELY INCAPABLE OF SELF-FERTILIZATION.

(*a*) *Varieties of European Origin.*

'Beurré d'Anjou.'
'Williams' Bon Chrêtien.'
'Doyenné Boussoch.'
'Beurré Clairgeau.'
'Doyenné Sieulle.'
'Easter Beurré.'
'Gansel's Bergamot.'
'Louise Bonne of Jersey.'
'Souvenir du Congrès.'
'Beurré Superfin.'
'Winter Nelis.'

(*b*) *Varieties of American Origin.*

'Clapp's Favourite.'
'Columbia.'
'De la Chêne.'
'Gray Doyenné.'
'Howell.'
'Jones.'
'Lawrence.'
'Mount Vernon.'
'Pound.'
'Sheldon.'
'Colonel Wilder.'

PEARS WHICH HAVE SHOWN THEMSELVES MORE OR LESS SELF-FERTILE.

(*a*) *Of European Origin.*

'Duchesse d'Angoulême.'
'Beurré Bose.'
'Beurré Diel.'
'Doyenné d'Alençon.'
'Flemish Beauty.'
'White Doyenné.'

(*b*) *Of American Origin.*

'Brockworth.'
'Buffum.'
'Heathcote.'
'Kieffer.'
'Le Comte.'
'Manning's Elizabeth.'
'Seckle.'
'Tyson.'

Self-pollinated pears are deficient in seeds, usually having only abortive ones, while in crosses they are generally well developed.

The practical conclusions are:—

1. Plant mixed orchards, or at least avoid planting solid blocks of one variety of pear. It is not desirable to have more than three or four rows of one variety, unless experience has shown it to be perfectly self-fertile.

2. Where large blocks of trees of one variety which blossomed well have failed to fruit for a series of years without any apparent reason, it is exceedingly probable that the failure is due to lack of cross-pollination. The remedy is to graft in other varieties and thus supply foreign pollen. In the case of a solitary pear tree in a garden not fruiting, it may be wise to plant another pear tree of a different variety, but blossoming about the same time.

3. Be sure that there are sufficient bees in the neighbourhood to properly visit the blossoms. When feasible, endeavour to favour insect visits to the blossoms by selecting sheltered situations or by planting wind-breaks.

The quince, which flowers later than the pear, seems to fruit nearly as well with its own pollen as with that of another variety; whereas apples were found to be more inclined to be sterile to their own pollen than pears, in the great majority no fruit resulting from self-pollination.

Mr. F. J. Chittenden,* now Director of the Research Station of the Royal Horticultural Society, in 1902 and 1903, in Essex, tested fifteen varieties of pears to see whether they would set fruit with their own pollen. The only two varieties that set fruit were 'Conference' and 'Durondeau.' The other varieties requiring cross-pollination were:— 'Beurré d'Amalis,' 'Beurré Superfin,' 'Catillac,' 'Doyenné du Comice,' 'Easter Beurré,' 'Emile d'Heyst,' 'Jargonelle,' 'Joséphine de Malines,' 'Louise Bonne of Jersey,' 'Williams' Bon Chrétien,' 'Olivier de Serres,' 'Bellissime d'Hiver,' and 'Pitmaston Duchess'; the last two varieties in the second year did set one fruit out of eighteen and out of twelve respectively.

Mr. Chittenden's experiments prove that among pears the proportion of self-sterile varieties is quite as large in England as in America.

About eighteen years ago, when farming at Swanley, I planted forty bush 'Pitmaston Duchess' pears, which for four years, although flowering well, did not fruit; I therefore removed them to another field about a third of a mile distant, and planted other varieties with them, putting a hive of bees on the border of the plantation. The following year the trees bore a fair quantity of fruit, and have continued to do so with fair regularity since. The probable reason of their failure at first was lack of foreign pollen.

The impotence of the pollen to fertilize another flower of its own variety is not due to any deficiency of its own, but to the lack of affinity between the pollen and the ovules of the same variety. The pollen of two varieties may be absolutely self-sterile and at the same time per-

* Journal R.H.S. vol. xxvii. (1902), p. cxc. and vol. xxviii. (1903), p. clxvi.

fectly cross-fertile. If a flower is fertilized with its own pollen and that from another variety, that of the different variety is pre-potent.

The fact that probably first called special attention to the benefit of cross-pollination among pears was that, in 1893, there was a large orchard in the United States planted with 20,000 'Williams' Bon Chrétien' pears, which although well grown and seventeen years old did not bear fruit except in the immediate neighbourhood of three pears of different variety that had been planted by mistake, namely, two 'Clapp's Favourite' and one 'Buffum' pear. The U.S.A. Department of Agriculture recommended intermixing other varieties of pear throughout the orchard, which, being done, the orchard became fruitful.

Apples.

The following is the blossoming record at Wye:—

—	Number of varieties	Length of time in bloom	Full bloom on
1908	70	15 days	6th day
1909	60	18 days	8th day
1910	66	17½ days	9½th day

From the three years' record the average length of time in flower of the different varieties is 17⅔ days, and the average time of coming into full bloom is on the seventh day (see Table I). In individual flowers the length of time from opening to fall of petals is about seven days.

In the "Journal of the Board of Agriculture," December 1908, pp. 678-687, and of April 1910, pp. 32-38, I have given a list of apples of 100 varieties in their average order of flowering taken from twenty-six records in different parts of England and in different years.

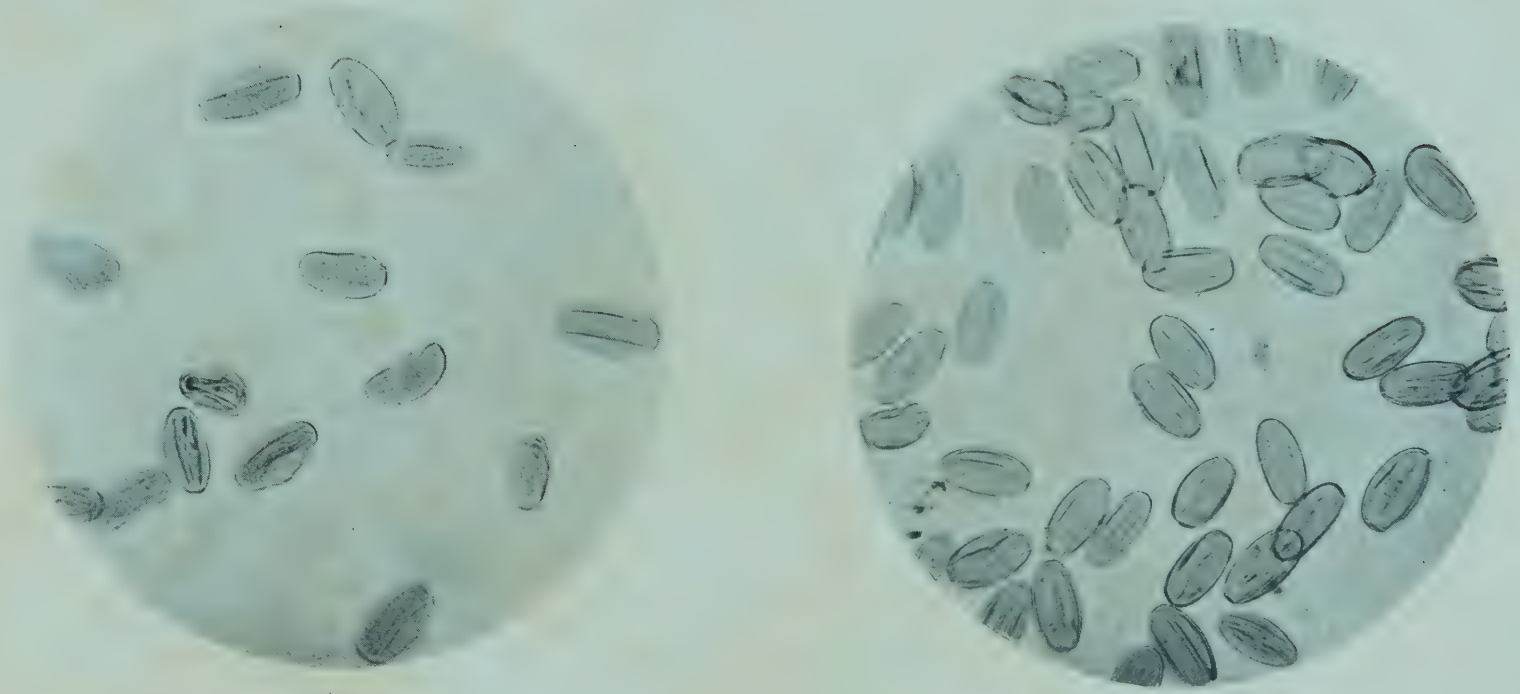
Careful records of flowering of fruit trees were kept for ten years by the late Mr. John Watkins, of Hereford, some of which were published in the "Transactions of the Herefordshire Fruit Growers' Association." The last "Report of the Woburn Experimental Fruit Farm" also gives a careful record of the flowering of apples based on a six years' record on both crab and Paradise stock.

In the apple the leaves unfold before the flowers open, the inflorescence is very frequently composed of six flowers, of which the central one usually opens first and produces the strongest and best fruit. The pollen is abundant and is more easily obtained than from the pear. The stigmas are ready for fertilization before the anthers have commenced to shed their pollen, and as the flower matures the stigmas grow out ⅛ inch to ¼ inch beyond the stamens. Bees and humble bees visit the blossoms.

The time of blossoming does not appear to be influenced by the stock on which the variety is grafted, as 'Stirling Castle,' 'Cox's Orange Pippin,' and 'Blenheim Orange' grafted for comparison on crab, English broad-leaved Paradise, French narrow-leaved Paradise, or 'Doucin' and the 'Nonsuch,' blossomed practically simultaneously

TABLE I.—AVERAGE DATES OF BLOSSOMING OF APPLES IN 1908, 1909, AND 1910, AT WYE, KENT, SHOWING TIME OF FIRST FLOWER WHEN IN FULL BLOOM, AND DURATION OF FLOWERING.

Variety	May																													June									Average Number of Days in Flower
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	
'Irish Peach'	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×																		20½
'Prince Bismarck'			×	×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×																20½
'Duchess of Oldenburgh'				×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																			17½
'Pearson's Plate'					×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																		18½
'Christmas Pearmain'						×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																	18½
'Golden Spire'						×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×																	18½
'Ribston Pippin'						×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×																20
'Baumann's Red Winter Reinette'						×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×																20
'Lord Suffield'							×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×																19
'Warner's King'								×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																	17
'Fearn's Pippin'								×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×																	17
'Stirling Castle'								×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×													21½
'Bramley's Seedling'								×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×															19½
'Duchess' Favourite'								×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																17½
'Mr. Gladstone'										×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×																	16
'Cox's Orange Pippin'										×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×																17
'Belle de Pontoise'										×	×	×	×	×	×	×	×	×	×	F	×	×	×	×	×	×																17
'Potts' Seedling'										×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																17½
'Beauty of Bath'											×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×																15
'Worcester Pearmain'											×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×																15
'Lane's Prince Albert'												×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×								21½
'King of the Pippins'												×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×												16
'Newton Wonder'													×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×					22
'Cox's Pomona'													×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×	×											18
'Mère de Ménage'													×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×													14½
'Lord Derby'													×	×	×	×	×	×	F	×	×	×	×	×	×	×	×														14
'Gascoyne's Scarlet'													×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×													14½
'Wellington'													×	×	×	×	×	×	×	F	×	×	×	×	×	×	×	×	×	×											16
'Blenheim Orange'															×	×	×	×	×	×	F	×	×	×	×	×	×	×													12½
'Golden Noble'															×	×	×	×	×	×	×	×	F	×	×	×	×	×	×	×											18
'Sandringham'																×	×	×	×	×	×	×	F	×	×	×	×	×	×	×											17½
'Graham's Royal Jubilee'																				×	×	×	×	×	×	F	×	×	×	×											19
'Court Penda Plat'																						×	×	×	×	F	×	×	×	×											15



A B

FIG. 164.—POLLEN OF PLUM (A) AND PEAR (B). (Highly magnified.)

(*To face page* 560.)

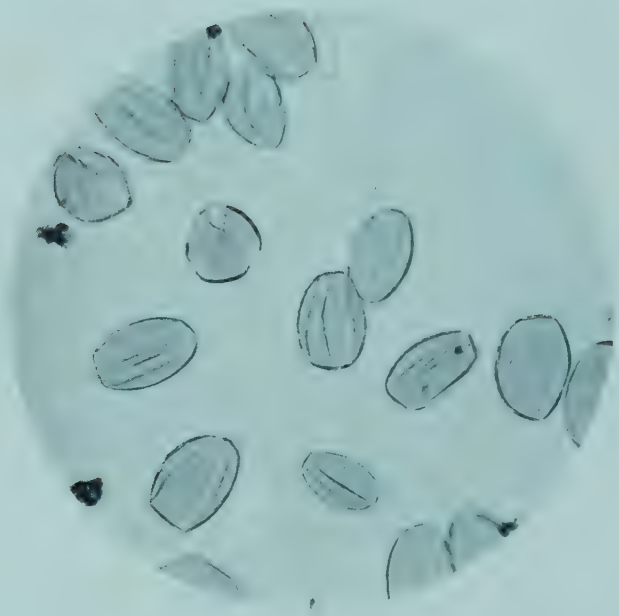


Fig. 165.—Pollen of Apple. (Highly magnified.)

Fig. 166.—Insects Caught at Apple and Other Fruit Flowers.
(By C. F. Vetch and C. H. Hooper.)

Reading from left to right : *Bombus lapidarius*, *B. terrestris*, *B. sylvarum*, *B. hortorum*, *B. derhamellus*, *B. muscorum*, *B. barbatellus* (Humble) bees); *Bombylius minor*; *Apis mellifica* (Hive bee); *Andrena sp.* (?); *Hoplocampa testudinea* (Apple Saw-fly).

on each kind of stock, with slight advantage in some cases of, say, half a day in favour of the Paradise.

In some cases standard trees commenced to flower a day or two later than bush and espalier; in some espaliers the branches nearest the ground commence to flower first. Trees growing on arable land appear to come into flower at much the same time as the same variety on grass, but if there is a difference, those on arable land are the earlier. Cider apples are in general later in flowering than cooking and dessert apples.

This year the crab flowered before apples generally, and the broad-leaved Paradise was among the late flowering apples.

It is found that flowers that have been fertilized are more resistant of the effect of frost than those unfertilized.

Of the apples *long in flower* in 1909 may be mentioned: 'New Hawthornden' in flower twenty days, 'Hoary Morning' twenty, 'Ribston Pippin' twenty-one, 'Bismarck' twenty-one, 'Graham's Royal Jubilee' twenty-one, 'Golden Noble' twenty-one, 'Baumann's Red Winter Reinette' twenty-two, 'Wellington' twenty-three, 'Newton Wonder' twenty-three, 'Lane's Prince Albert' twenty-two to twenty-six days.

Hoffmann, of Giessen,* in 1886 determined the relative retardation of vegetation as determined by the dates of the first blossom of several plants at different altitudes. The result for the pear is a retardation of 3.7 days for each 100 metres, and corresponding to this a retardation of 2.8 days for each 1° of latitude, in the case of apple two days for each 100 metres and 4.4 days for each 1° of latitude.

In New York State from a record of six years the average duration of flowering of apples was nine days; no correlation generally was found between the time of flowering and that of maturing of the fruit, but much stress is laid on the importance of cross-fertilization and the planting together of varieties that bloom simultaneously. In spraying apples, also, it is a convenience to have varieties that are in flower at the same time near together.

In the experiments of C. T. Lewis and C. C. Vincent in 1907 and 1908 on the "Pollination of the Apple" at the Oregon Agricultural College at Corvallis, it was found that out of eighty-seven varieties of apple fifty-nine were self-sterile, thirteen partially fertile, fifteen fertile, including 'Keswick Codlin,' 'Duchess of Oldenburgh,' and 'Washington.'

Mr. Chittenden, in his trials with apples, found, out of twenty-four varieties of apples, only 'Gladstone,' 'Stirling Castle,' and 'King of the Pippins' set fruit without the influence of foreign pollen. This year I placed paper bags over buds of about twenty varieties of apple, to test whether they would set fruit with their own pollen, but none set, and only one set among pears, and that fell off later.

Comparison of Order of Blossoming in England with other Countries.—A note in the "Journal of the Department of Agriculture of Victoria,

* *Relations Between Climate and Crops*, by Cleveland Abbé, p. 242.

Australia," for November 1908, states that 'London Pippin,' 'Annie Elizabeth,' and 'Reinette du Canada' are the last to bloom. In England 'London Pippin' and 'Annie Elizabeth' are also among the last apples to bloom. In the United States: 'Black Diamond' is recorded among the first plums to flower and 'Pond's Seedling' among the last; 'Duchesse d'Angoulême' among the early flowering pears; among the early flowering apples 'Gravenstein,' 'Keswick Codlin,' 'Duchess of Oldenburgh,' 'Twenty Ounce,' 'Wagener' are mentioned; among the medium bloomers 'Reinette du Canada,' 'Dutch Mignonne,' 'Gladstone,' 'Emperor Alexander,' 'Bismarck'; among the late bloomers 'Beauty of Bath,' 'Northern Spy,' 'Red Astrachan,' 'Ribston Pippin,' 'King of the Pippins,' 'Cox's Orange,' and 'Lane's Prince Albert.' Showing that in general the order of flowering is similar in different continents.

In the United States fruit botanists are investigating which varieties of apple produce the pollen best suited to some of their best varieties, and they find that there is considerable difference between different sorts; may we not in England ascertain the best pollen for the fertilization of, say, 'Cox's Orange Pippin' apple or 'Williams' Bon Chrétien' pear? There are many interesting problems for the fruit grower who is also a naturalist.

The United States authorities lay stress on planting near to one another varieties that flower at the same time. In New York State* apples commence to flower from May 10 to 19, and finish flowering between May 17 and 29. The average duration of flowering is nine days. In England the trees are in flower about the same time, but the varieties remain in flower nearly twice as long. Mr. NIELS ESBJERG, of Esbjerg, a Danish expert in fruit growing, told me he had often observed in Denmark that when a single apple, pear, or cherry was planted in a garden at a distance from other fruit trees it bore little or no fruit. From the experience of many, myself included, the value of bees in or near orchards should be strongly emphasized.

Under the title "Some Conditions that Influence the Germination of and Fertility of Pollen," Mr. E. P. SANDSTEN† has some interesting remarks on the influence of various temperatures, &c., on the germination of pollen.

STRAWBERRIES.

The following is the record at Wye:—

—	Commenced to flower	In full bloom	Continued in bloom till	Picking from
1908	May 19	—	End of June	June 11 to July 18
1909	May 9	—	July 6	June 14 to July 22
1910	May 11	May 24	—	June 11 to July 11

* *The Relation of Weather to the Setting of Fruit, with Blooming Data for Eight Hundred and Sixty-six Varieties of Fruit*, by U. P. Hendrick. New York Agricultural Experimental Station. March 1908.

† *U.S.A. Exp. Stn., Wisconsin, Research Bull.* 4 (1909). See also Abstract in this JOURNAL, vol. xxxvi. p. 513.

Picking in most seasons begins about four weeks after flowering commences; if there is frost shortly before the flowers open, the earliest open with black centres and do not set fruit; towards the end of the season the last flowers are apt not to set fruit.

The pollen of the strawberry is very plentiful; it is date-shaped, resembling that of raspberry, but is far more plentiful. The strawberry does not seem to be as dependent on insects for pollination as most of the other kinds of fruit. In the photograph of pollen there are some grains of either immature pollen or possibly pollen brought to the flower by an insect from another kind of flower. The strawberry has a ring-like nectary between the rim of the "saucer" and the central carpel-bearing knob. The honey is only slightly concealed by the stamens and the flowers are visited by flies as well as by larger and longer-tongued insects, such as bees. The stigmas become receptive, *i.e.* reach their full size and become sticky, before the anthers of the flowers open to shed the pollen, so that self-pollination is to some extent hindered and cross-pollination generally takes place.

Raspberries.

The approximate dates of flowering at Wye were as follows:—

—	Commenced flowering	Full bloom	Continued in flower till	Picking commenced
1908	**May 28**	**June 3**	**—**	**July 14**
1909	**May 24**	**June 2**	**July 6**	**July 14**
1910	**May 24**	**June 4**	**July 10**	**July 14**

In the raspberry the leaves commence to open some five weeks before the flowers commence to open; raspberries are in flower from first to last about six weeks. As the leaves are fully expanded before the flowers open, and as raspberries flower late in the season, they are seldom caught by frost. The pollen appears to be shed only during a short part of the time the flowers are open, and seems to be small in quantity.

This year I placed paper bags over three bunches of flowers before any blooms had opened, and on untying them later in the season when fruit was ripe was surprised to find in each case that the fruit was almost as plentiful, and some berries larger than those in the open; the bagged fruits apparently had smaller seeds and were more fleshy. Sir John Lubbock, speaking of the wild raspberry, says: "Though the raspberry secretes honey, it is not apparently a great favourite with insects, and frequently fertilizes itself."* This may account for the above result.

Blackberries.

"The flowers of blackberry are much more conspicuous than those of the raspberry, and the stamens are turned more outwards, so as to leave more room between themselves and the pistil. They appear to be much frequented by insects. The stamens ripen gradually from the

* *British Wild Flowers in Relation to Insects.*

outside inwards, there is considerable interval during which, although the pistil is mature and some of the anthers are ripe, yet self-fertilization is difficult; while from the great frequency of insect visits, fertilization is generally effected before the inner anthers are ripe."* This year I placed paper bags over flower buds of both blackberry and loganberry, but neither set fruit, apparently requiring insects to pollinate them.

Insects in Relation to Fruit Blossoms.

Flowers attract insects by their colour, perfume, nectar, and pollen. Aristotle more than 2,000 years ago observed that all kinds of bees and certain other insects usually confine themselves on one journey to a single species of plant; they are good botanists, for they know that varieties may differ widely in colour of their flowers and yet belong to the same species. Bees will, however, visit closely allied plants, as the various buttercups, or two kinds of clover. By examining the pollen on the bodies of hive and humble bees one sees that the habit is general, but not invariable. In some pollen taken from the leg of a bee by Mr. F. Edenden, he found about nineteen-twentieths of one kind of pollen and one-twentieth of another kind.

Müller says: "Bees almost always alight in the middle of the apple flower, and so usually perform cross-fertilization even in the older flowers, since the five stigmas overtop the stamens and are the first to touch the pollen-covered lower surface of the insect. The conspicuous flower and easily accessible honey attract many insects, and cross-fertilization is insured by the fact that the stigmas are ready before the stamens and also by the prominent position of the stigmas, although here and there flowers occur in which the stigmas are in immediate contact with the anthers." Müller records sixteen different insects as visiting apple flowers.

"In plums and apples and pears the stamens form a palisade which keeps out short-tongued insects; this is especially marked in flowers like those of the quince, which are largely visited by bees (the short-tongued ones only getting pollen) and the receptacle in the quince being often bored by the bees." †

Humble bees, hive and wild bees, appear to be the chief carriers of pollen; some flies, such as the black fever fly, visit fruit blossoms, appear to eat the pollen, but do not seem to help much in distributing it.

Humble bees continue their work into the early evening and during slight showers.

In conclusion, my thanks are due to many who have most kindly sent me their records of blossoming to take notes from, to the Principal and to the Lecturer in Fruit-Growing of the South-Eastern Agricultural College for allowing me to make my observations and experiments in the College fruit plantation, and to Mr. F. Edenden, of Wye, for his patience and skill in photographing blossoms and pollens, and diagrams for the lantern slides exhibited.

* *British Wild Flowers in Relation to Insects*, by Sir John Lubbock.
† *Fruit Flowers and their Work*, by Dr. F. Cavers, of Southampton.

CIDER AND PERRY FRUIT.

By B. T. P. Barker, M.A., Director of the National Fruit and Cider Institute.

(Substance of Lecture read October 11, 1910.)

The present condition of a typical cider or perry orchard in the West of England reflects in striking fashion the lack of interest and care taken in orchard cultivation during the greater part of last century. At the beginning of the century cider was still held in high esteem; but various causes were responsible for the decline in vogue of the beverage, with the result that the orchards had in most cases a minimum of attention bestowed upon them. It was not until about twenty-five years ago that renewed interest began to be taken in them. The publication of the Herefordshire Pomona by Dr. Hogg and Graves Bull practically marks the beginning of modern effort to raise the orchards to a better standard by those interested in the cider industry.

In these old vintage orchards not only are evidences of past neglect shown in the moss- and lichen-covered trees, their dense, entangled, unpruned character, and their pest-ridden condition, but also in the hopeless and infinite variety of different kinds of apples and pears. In a five-acre orchard there may be as many as from fifty to a hundred different varieties to be found; and usually an appreciable percentage of these are peculiar to the orchard and not found elsewhere. This feature is doubtless due to the fact that seedling stocks used to be planted with the intention of working selected varieties upon them in due course; but through neglect or some other cause the grafting was omitted, and the young stocks were allowed to develop untouched. Naturally, with such miscellaneous material to work with, the modern cider-maker is seriously handicapped in any endeavour to produce a uniform type of cider or perry. He can neither obtain a sufficient quantity of fruit of selected varieties, nor can he possibly hope to gain the knowledge of the characters of all the individual varieties with which he is compelled to deal, which is necessary for them to be utilized to the best advantage.

The history of existing vintage orchards easily explains why vintage fruit is so commonly looked upon as inferior and hardly worthy of attention. As a matter of fact, the majority of varieties used for cider- and perry-making have no better claim to be considered as vintage fruit than the fact that they are worthless for other purposes and are therefore brought to the press rather than wasted. The characteristic features of a true vintage apple or pear are as strongly marked as those of a standard table variety. They are mainly chemical in character, and will be considered in due course. There are, however, certain

other characters of growth and habit which serve generally to distinguish typical vintage varieties from table ones, although no hard and fast line can be drawn. Usually the typical vintage fruit is distinguished by its small size and by the hardiness and prolific cropping habits of the trees as compared with the typical table variety.

The more or less decrepit condition of the majority of cider orchards is a cause of considerable concern to those interested in the cider industry. The planting of fresh orchards is certainly not being undertaken sufficiently extensively to compensate for the dying out of the older orchards; and sooner or later, therefore, a serious shortage of vintage fruit is bound to occur unless this state of affairs is altered. A serious check will be given to the industry, since in addition to the need of maintaining the present supply of fruit a considerably greater quantity will be required in the near future, if the present advance in the popularity of cider as a beverage is continued. The majority of young trees which are being planted are used to fill up gaps in old orchards. The practice is not desirable, and does not offer much promise for the future efficiency of the orchards; but in most cases it is unavoidable, partly on account of the difficulty of obtaining fresh land to establish entirely new orchards, and partly on account of the common custom of the tenant being obliged to fill up the spaces as they occur through the death of old trees. Another serious drawback to the planting of new orchards is the length of time which must elapse before the trees begin to bear profitably. The typical cider orchard, which is an adjunct to nearly every farm in the cider districts of the West of England, is composed of standard trees, raised on free stocks, and planted in grass, which is utilized for grazing purposes. Before they begin to bear freely little attention is paid to them, and consequently a large proportion of the trees are failures. For that reason in many quarters the planting of new orchards is not viewed with favour by the landowner, who is generally responsible for the provision of the trees. In order to overcome the difficulty of the long period of waiting for the crop, with its attendant disadvantages, a suggestion has been made to cultivate the trees as bushes, worked on the Paradise stock, according to the common practice for market varieties. A few bush plantations of vintage varieties have recently been planted, and the results will be awaited with considerable interest.

The miscellaneous character of the varieties in the old orchards has already been referred to. In some cases the varieties are of high vintage quality, but in other instances they are of little value. On account of the host of varieties there are comparatively few about which there is reliable information as to their vintage value. There is no doubt that, hidden away unknown in many orchards, there are varieties of the highest value, at least equal to that of any of the better-known and popular ones. An instance may be quoted in the case of an apple known as 'Butleigh No. XIV.' When Mr. F. J. Lloyd a few years ago was conducting experiments in cider-making on Mr. Neville

Grenville's estate at Butleigh, he made an examination of several local varieties growing in the orchards there, and discovered in the apple named a type whose juice was extraordinarily rich in sugar, and consequently of great value for vintage purposes. At that time, as far as is known, there was only the single tree of that sort in existence. The variety has since been propagated extensively at the National Fruit and Cider Institute, where much work in the direction of investigating the vintage qualities of these rare sorts, as well as of the better-known ones, is being carried on. In the nurseries at the Institute there are being propagated young trees of all the most promising kinds discovered; and as these trees attain suitable size they are being planted at various centres in the cider-making districts, with the object of testing the suitability of the individual kinds to those localities. During the past two years forty-seven of these trial orchards have been established; and in due course the information derived should prove of the highest value to the cider-making industry.

Vintage apples and pears may be divided into three classes, according to the character of the juice and, thus, of the cider produced. One class, the "sharp," or "sour," is characterized by the comparatively large amount of malic acid contained in the juice; and, as the name denotes, the flavour is decidedly on the sharp side. Used alone such varieties yield a sour or brisk cider, generally rather thin and lacking in body. The members of the second class, the "bitter-sweets," are distinguished by the bitter, astringent flavour of the juice and cider, due to the presence of a comparatively large amount of tannin. Generally the type of cider produced is rich and full-bodied; but since the acidity is usually very low, it lacks briskness and life. The third class, the "sweet," is composed of apples of a more or less negative type of flavour, the juice containing very little acid or tannin, the cider consequently being usually of an insipid character. As a rule most sorts do not yield the best type of cider if made up singly; but by suitable blending of apples belonging to each of the three classes mentioned it is possible to produce a beverage containing all the desirable qualities of each with the characteristic features suitably toned down.

Individual members of each class vary greatly in vintage quality. As distinct from the quality of the juice as regards acidity and astringency—features which can be adjusted at will by suitable blending to bring the percentages of malic acid and tannin within desired limits—vintage quality depends mainly upon two factors—(1) the richness of the juice in sugar, and (2) the rate of fermentation of the juice. The average amount of sugar in most varieties varies from 10 to 12 per cent., which is equivalent approximately to a content of 5 to 6 per cent. of alcohol in the mixture of cider or perry if the sugar is completely fermented. There are several varieties which can be relied upon to show 12 to 15 per cent. of sugar in an average season, and a few give even larger amounts. The importance of the sugar content of the juice is that the amount of alcohol which it is possible

to produce by complete fermentation is determined by the amount of sugar, and upon the amount of alcohol present depends very largely the keeping qualities of the cider or perry. At the same time, the larger the amount of sugar there is present the greater scope has the maker to regulate the character of the cider or perry produced as regards its degree of sweetness. This point, however, is influenced to a greater extent by the second factor of vintage quality mentioned, viz. the rate of fermentation of the juice. The rate varies very greatly in juices from different varieties. If it is excessive, the fermentation is too vigorous and cannot be controlled, with the result that only a "dry" cider or perry—that is to say, a cider that has lost all its sugar, and, therefore, its sweetness—can be made. On the other hand, if the rate is too slow, while it is easy to regulate the fermentation so that any desired degree of sweetness can be retained, the cider or perry is unfortunately extremely liable to contract certain disorders which detract seriously from its value. The flavour of a cider or perry which has undergone a slow fermentation is almost invariably superior to that of one which has fermented rapidly. The best type of fermentation is one of a moderately slow rate, which enables the maker to control it at will and to produce a beverage of any degree of sweetness desired.

There are several other features which affect vintage quality; but they are, speaking from the point of view of the quality of the cider or perry produced, of secondary importance only. As such may be mentioned the yield of juice—a good variety being capable of giving as much as 80 per cent. of the weight of the fruit with the best modern types of machinery—and the texture of the fruit. The latter point is in certain seasons, when the fruit does not keep well, especially important, since, in gathering, the fruit is almost invariably more or less bruised, and soft-fleshed apples accordingly quickly begin to decay, and frequently, therefore, have to be milled before they are really fit for cider-making. Vintage quality is also affected by a number of external factors. The kind of soil in which the fruit is grown, the character of the season, and the degree of ripeness of the fruit at the time of making, all exercise a material influence upon the quality of the cider or perry. Even the age of the trees has an appreciable effect, the liquor made from the fruit of young trees being relatively less rich and of a coarser type.

The question of the desirability of utilizing market varieties of apples for vintage purposes has often been discussed. While it is possible to produce a palatable beverage from them by suitable treatment, especially if they are blended with good sweet and bitter-sweet vintage varieties, the type of cider is as a rule markedly inferior in richness and quality to that prepared from standard vintage kinds. The composition of the juice of a typical market apple indicates clearly its unsuitability for vintage purposes. The acidity is generally relatively high and the amount of tannin extremely small, while the sugar is also deficient. In addition, the rate of fermentation is usually very

rapid. The natural type of cider produced is therefore a thin, sharp beverage, lacking sweetness, and deficient in body and keeping qualities.

In some quarters there has been a tendency to advocate the cultivation of market varieties to the exclusion of vintage varieties, with a view to the utilization of the small, unsaleable, and damaged culinary and dessert apples for cider-making instead of true vintage ones, it being asserted that the latter are not so profitable to grow. It is difficult to obtain any satisfactory statistics which bear on that point; but it is very problematical which is the better-paying crop. It may be safely asserted, however, that the cultivation of vintage fruit yields very satisfactory returns with proper treatment, and that there are few crops which can show equally good profits when the small amount of labour and trouble entailed are taken into consideration.

CIDER-MAKING.

By B. T. P. Barker, M.A.

[Read December 1, 1910.]

A survey of the principles and practice of cider-making would be incomplete without some preliminary account of the harvesting and storage of the fruit before it is brought to the mill. It should be recognized that cider-making really begins in the orchard, and that mistakes made in the handling of the fruit prior to pressing cannot afterwards be rectified by any amount of care on the part of the cider-maker. Indeed, it may rightly be claimed that, provided rational methods of management of the juice after pressing are adopted, the quality of the cider is determined by the condition of the fruit at the time of milling.

The first point of importance in the orchard work, as far as it is directly concerned with cider-making, is the selection of the right moment for gathering the fruit. Cider fruit should not be gathered until it will fall freely from the tree, when the latter is lightly shaken. It is not good practice to allow it to fall of its own accord, since under those conditions a considerable quantity may lie on the grass beneath the trees for several days before being picked up, and may therefore acquire a serious earthy taint in flavour which it is impossible to get rid of in the cider. The most satisfactory plan is to go round the orchard at regular intervals of a few days, shaking lightly with a wooden crook all trees on which the fruit is approaching complete maturity. As the fruit falls on to the grass below, it should at once be gathered up, or it can be collected in a harvest blanket spread beneath the tree to receive it. As far as is practicable, different varieties of apples should not at this stage be mixed together, as it is far better for purposes of blending to store the varieties separately.

After gathering, the fruit generally requires storage for some time before pressing, the length of time varying according to the variety of apple and the character of the season. This period of storage is highly desirable in order that the juice may develop the maximum degree of richness and quality. Where practicable, storage under cover—*e.g.* in an apple loft—is to be recommended as being the safest plan; but, where this accommodation is not available, outdoor storage in hurdle stores gives almost equally good results, provided that the weather is not too wet or frosty, in which cases some form of cover as a protection should be arranged. The fruit ought never to be stored in heaps resting directly on the ground, on account of the risk of an earthy taint in flavour being acquired by the lower layers. Whether stored indoors or out of doors, the depth of the heap should not be more than from

two or three feet, on account of the liability of the fruit to "heat." If this occurs, it is accompanied by acetic fermentation; and the cider will afterwards show a more or less pronounced vinegar flavour.

Considerable practical experience is necessary to decide when the fruit has been stored sufficiently long and is in best condition for pressing. The usual test is to press a number of specimens between the thumb and fingers. If the flesh of the fruit yields readily to the pressure, the apples are considered to be fit for milling, whereas if the flesh is more resistant, the making is deferred. Some allowance must be made for the natural differences in texture between individual varieties.

Cider mills may be grouped into two classes, according to the manner in which the fruit is pulped. The more primitive types reduce the fruit to a fine state of division by first breaking up the apples into coarse lumps and afterwards breaking these up more finely by means of heavy stone or metal rollers. In such cases the fruit is pulped by *crushing*. The most modern types disintegrate the apples to an extremely fine pulp by means of a rapidly revolving cylinder or drum, carrying rows of slightly projecting toothed knives. In these cases the fruit is pulped by *grating*, no crushing whatever coming into play. Both systems have their advantages and disadvantages, the former yielding a juice of softer and fuller flavour, and the latter producing a very high yield of juice and being very rapid in its action. The ideal mill, which will combine the crushing and the grating actions, has yet to be made.

After the fruit has been milled, some makers prefer to allow the pulp to stand in a wooden vessel for twenty-four hours or so before pressing, their contention being that the quality of the juice is improved. This has not been conclusively demonstrated; but there is no doubt that the juice can be more easily expressed after this period of "maceration," and that the total yield is rather higher than in cases where the pulp is pressed immediately. Other makers favour the latter procedure, holding that any gain by the previous method is so slight as to be negligible in comparison with the inconvenience and the risk of taint to which the pulp is exposed by standing several hours in the cider house.

Various types of hand and power presses are in use. Before being pressed the apple pulp is built up into a "cheese." The modern style of cheese consists of a series of layers of the pulp about three or four inches in thickness, placed one above the other, each layer wrapped in a cotton or fibre net or cloth, and separated from those above and below by wooden racks, which are used to facilitate the draining away of the juice as pressure is applied. The old style of cheese consisted of layers of pulp, wrapped round and alternating with layers of straw or reed. After as much juice as possible has been expressed, the remainder of the cheese is often broken up by hand and re-pressed.

The juice, as it runs from the press, may be nearly clear and almost

free from suspended solid matter; or it may be cloudy and muddy-looking, and contain a large amount of suspended particles of apple pulp. In the former case it is generally advisable to pump it at once into the fermenting casks; but in the latter case it may be "keeved" with advantage. This is done by allowing it to stand for several days in a large open vat or "keeve," until a thick brown head has been thrown up. The clear juice between this head and the sediment deposited in the vat is then carefully racked into the fermenting casks.

The juice is usually allowed to ferment spontaneously, and the first signs generally appear in a week or so. The course of fermentation is closely watched, and its progress is gauged by taking frequent records of the specific gravity with a hydrometer. When it is desired to check fermentation, racking may frequently be resorted to with success; but progressive makers now use specially constructed filters to arrest fermentation when it has reached the stage required.

After the final racking, when the cider has begun to "fine" itself, or after filtration, as the case may be, the cider is placed in the store casks to mature. These are filled full and kept tightly bunged down, since it is essential that from this stage onwards as little air as possible should reach the cider; otherwise acetification will inevitably take place. After a few weeks under these conditions the cider is fit for consumption.

The character of the cider produced depends very largely upon the varieties of apples used. Cider apples may be divided into three main classes—(*a*) the "sour" or "sharp," containing a relatively high percentage of malic acid; (*b*) the "bitter-sweet," containing a small amount of malic acid and a high percentage of tannin; and (*c*) the "sweet," containing low percentages of both malic acid and tannin. By suitably blending members of these three classes, either by mixing the fruit itself before milling or by blending the juices or mature ciders, a liquor containing proportions of malic acid and tannin in the desired degree can be obtained. The standard of composition aimed at is usually .35 to .65 per cent. of malic acid and .15 to .25 per cent. of tannin.

The quality of the fresh juice depends largely upon the amount of sugar it contains. The average juice has a specific gravity of about 1.050, which represents approximately about 10 per cent. of sugar. Good juices may range in specific gravity between 1.060 and 1.075, with the amounts of sugar varying from 13 to 16 per cent.

Comparatively few varieties yield really good ciders when used alone, usually on account of the juice containing an excess or a deficiency of one or more of the necessary elements of flavour; and they generally possess an individual character more or less distinct from that of any other variety. Varieties belonging to the sharp class exhibit this feature to a marked extent. Hence the character of a cider is to a very great extent determined by the varieties of apples used.

While the quality of any variety varies considerably under different conditions, its characteristic features are generally fairly constantly preserved. For example, the amount of sugar, the degree of acidity and

astringency, and the rate of fermentation of the juice are fairly uniform in comparison with the corresponding features of other varieties. The most important factors influencing the quality of the juice appear to be the type of soil upon which the fruit was grown, the age of the tree, the degree of ripeness of the fruit at the time of pressing, and the nature of the season.

The rate of fermentation of the juice is a feature of special importance, since it practically determines the type of cider which can be produced. It varies greatly for different varieties, the fermentation being practically completed in some cases within three weeks or a month, while in others it may continue in very slow fashion for months. It is extremely difficult, if not impossible, to produce a sweet cider by natural means from a juice which possesses a rapid rate of fermentation; but a juice which ferments slowly can generally be made to yield without difficulty either a sweet or a dry cider.

Contrary to the general impression, the rate of fermentation does not depend to any great extent upon the kinds of yeast present in the juice. It is rather a question of the nutrition of these organisms. Juices rich in assimilable nitrogenous material favour their rapid multiplication, and consequently a high rate of fermentation, while those deficient in those substances are unsuited to the healthy growth and increase of the yeast plants, and therefore ferment slowly. The kind of yeast present is, however, a matter of some importance from the point of view of flavour, certain yeasts producing a coarse, unpleasant taste, and others a delicately pleasant one. In cider made under ordinary conditions there are usually at least from six to twelve different kinds of yeast present, so that their combined effect is a rather difficult matter to determine. It has been recommended that the fermentation should be regulated by the use of selected yeasts. This has been attempted by several makers, and although there is much to be said in its favour, it is doubtful if the results are sufficiently superior, when working under present conditions, to justify the extra trouble involved.

Finally, success in cider-making can only be obtained by scrupulous attention to cleanliness in every detail, both in the handling of the fruit before making and the manipulation of the juice from the time of pressing onwards. Taints in flavour cannot be eradicated; and uncleanliness favours the development of the various disorders to which cider is liable. Unremitting attention is also essential at all stages in order to hit upon the right moment at which the various operations may be performed to the greatest advantage. Neglect, even if only temporary, is almost certain to lead to failure.

FRUIT-GROWING IN THE COLONIES.

By H. Hooper, F.R.H.S.

[Read December 1, 1910.]

The magnificent exhibition of fruit at the Colonial Fruit Show must give rise to not a few reflections and questions in the minds of all who saw it.

Pre-eminently will arise the questions: How is all this done? How is this general level of superexcellence to be accounted for? How is it that in regions so widespread the general perfection in "the fruit-growing industry," as such exhibitions as this give proof of, has been arrived at?

The usual response to that reiterated question will undoubtedly be: "Climate," or, perhaps, "Soil and climate," and the matter will be dismissed with an envious sighing for soils and climates that can do so much. But is it to soil, or climate, or both, that the achievement is due? Let us reflect for a moment how widely apart lie the British Possessions which are able to display to us, here at the heart of the Empire, such magnificent fruit-products. Are each and all of them endowed with soil and climate so propitious that, upon that basis only, a great fruit industry can be founded and maintained? Be it remembered that certain kinds of hardy fruits—kinds, and even varieties, identical with some of those which the Colonies send us—can be raised to a higher state of perfection in the soils and climate of the Mother Country than in any other soils and climates the world over. From that fact alone may we not infer that other agencies than these have been at work in building up these great and growing colonial fruit industries?

Our fellow fruit-growers in the Colonies have, I assure you, the same soil problems to deal with as we have; their plantations, for the most part, have been established long enough for the supplies of plant food that were stored up in the soil when it was virgin to have been long since exhausted, and they are faced, as we are faced, with the necessity of renewing supplies of plant-food in the soil; they have to mend soils as we do; they have to feed their trees for growth, or for colour, flavour, and size of the fruit, as we have to feed our trees.

We never tire of abusing this climate of ours for its "vagaries." Do our colonial friends, then, know nothing of "climate vagaries"? Ask them. Ask the men who have grown this very fruit we have been feasting our eyes upon: do they know nothing of late frosts, or unexpected early frosts, of blistering heat-waves, or devastating bizzards and hurricanes, of dry spells when rain is needed, or deluges when fruit-trees are blossoming or fruit nearly ripe? They know all

about these "vagaries," but they know also something of how to protect their orchards from them and how to minimize their evil effects.

If soil and climate, then, have nothing, or so very little, to do with the high state of efficiency to which fruit-growing as an industry has been brought in overseas Britain, what are the main factors leading to the achievement of such magnificent results; what are the real causes to which such signal success must be attributed?

They are "The men and their methods." Man in community has achieved these results; man collectively has done what man by individual effort alone could not do.

The inception, the advance, and the arrival to its present flourishing condition of this colonial fruit industry is the outcome of combined effort; of combination all along the line, from the orchards, thousands of miles away from here, to the marketing of the crops of those orchards here in our very midst.

Community of interest has engendered community of action. Man, the practical fruit-farmer, works in harmony with man, his practical neighbour, knowing their interests to be identical; man, the scientist, is yoke-fellow with man, the practical; and man, the statesman and official, sees to it that an industry which has such potentialities in the scheme of the development of a young State, has every support which wise protective legislation and official supervision can afford it. "Community of interest," then, is the motive power to this combined action, and organization the means whereby this combined action achieves its ends. Out there, beyond seas, it is accepted without argument that a man's interests are closely bound up with those of his fellow-men, and that the prosperity of the individual is the only sure foundation for the welfare of the State, and especially the prosperity of those who spread themselves out upon the land and bring it under cultivation. And upon these axioms they base their policy.

No form of land cultivation lends itself more effectively to the founding of the "rural setlement" than fruit-farming. On a comparatively small holding the experienced fruit-farmer can make an excellent livelihood. Thus many fruit-farmers are permitted to congregate and carry on their business in close proximity, and that great bar to effective combination, distance, is removed. Added to the business advantage of this close settlement are the social advantages it affords—a very important consideration indeed. The rural settlement is indeed an all-powerful factor in the development of a young nation, as it is the all-important—though not adequately acknowledged—factor in maintaining racial vitality in older nations. Recognizing this fact, the administrators of the Governments of these young States—wise in their political economy—encourage and foster the fruit industry in that it is so powerful a factor in the establishment of "rural settlements" on a firm basis. Fruit-growing is a craft which appeals to the intelligent and industrious; intelligence and unflagging industry are essential to success in it, so the very class of settler most useful in nation-building is attracted to and kept upon the land.

No wonder, then, that we find the State so intimately associating itself with the colonial fruit industry.

Now let us betake ourselves for a few moments to a colonial fruit settlement. What do we find? A community of intelligent workers, following their calling with uniformity of methods practically sound and endorsed by science. When practice and science are agreed that some method in vogue may be safely superseded by some new method or course, the old is promptly and universally discarded and the new method adopted. These fruit-farmers are no slaves to custom and habit, but ever ready to change if change means progress.

In such a settlement one will find that, just as cultural methods and management are of a uniform type, so, too, are the kinds, and even varieties, of fruits under cultivation practically identical on all the farms. The district having been found to be especially favourable to raising certain kinds and varieties of fruit to a high degree of perfection, practically all the farmers devote their land to those fruits, the principle of producing in quantity a few varieties of fine quality rather than small quantities of several varieties unequal in quality meeting with general acceptance as a sound business principle.

Thus, however small the individual holding may be, the produce of it is of the same nature as that of the settlement in general, and when the time arrives for the handling of the crop it may be graded, packed, and marketed with a large bulk of similar produce, the small grower sharing with the large grower all the benefits and economies resulting from co-operation in all the processes of crop-handling, and finding a market for his fruit that but for co-operation he could never gain.

This system of "fruit-growing in communities" spells advantage to the individual grower in many respects—advantage that must be wanting to the isolated farmer. No settlement is without its "association," "union," or "society" of planters, and through this body the individual grower has the means of obtaining all the technical assistance he may need in his orchard work, as well as advice, information, and co-operation in the business of the disposal of produce.

All the while the paternal administration of the State, through its Department of Agriculture or Bureau of Horticulture, takes care that no "expert" guidance is lacking to a community of growers—guidance of a kind that the single individual could obtain only with great difficulty, if at all. The State maintains a trained band of practical and scientific experts always at the disposal of the industry. The excuse of "not knowing how" is barely possible. Did the growers not avail themselves voluntarily of the assistance which the State provides it would be gently but firmly forced upon them. The State well knows that its own aims would be thwarted were the industry to languish from lack of expert guidance and official supervision, and makes provision for both. As a body the fruit-growers readily avail themselves of this provision; occasionally the individual may be lax in this respect. Mindful that the thriftless, careless individual in a community of growers is a danger to that community, the State puts legislation in

force to protect the community from that individual, and that individual from himself.

The very fact that such legislation exists is proof positive—were proof needed—of the thoroughness and earnestness of the growers themselves. Did they not appreciate what a power for good, and how indispensable to the stability of the industry it is, either the legislation would be rescinded or the fruit-growers would betake themselves to some other calling. This protective legislation is not peculiar to any one or two of the fruit-producing Colonies, but in some form or another obtains in them all. To quote the various Acts *in extenso* would be tedious and unnecessary, but a list of a few, selected haphazard, will serve to show how very general this legislation is.

For examples of its nature and efficiency we have but to look up the Statutes of Canada and read parts ix. and x. of the Staple Commodities Inspection and Sale Act. Or, among the Statutes of Ontario, to find "An Act to prevent the spread of insect and fungus pests injurious to vegetation"—a very fine Act. Then, in British Columbia, they have a comprehensive "Act respecting the Provincial Boards of Horticulture"—a piece of legislation worthy of careful study. Nova Scotia, too, has, *inter alia*, "The San José Scale Act of 1898." All the Australian States are also well to the fore with legislation of like intent. Nearly twenty years ago Tasmania found it necessary to fight the Codling Moth with a "Codling Moth Act," and the youngest of the colonial fruit industries—that of Western Australia—is second to none in this matter of protective fruit legislation. Is it not clear, then, that what is so general must be at once necessary and beneficial?

Anyone interested enough to make a closer study of this matter will, I am sure, be permitted to do so, at their offices, by the courtesy of the Colonial Agents-General in London.

Let us return to the fruit and the fruit grower.

Now what are the most remarkable features about all this fruit the Colonies send to us: not merely the show samples in our hall here, but the bulk of it as it comes into our markets? Are they not the grading, the packing, and the universal cleanliness of it, its freedom from blemish by fungus disease or insect-pest? And is it not these same features which pre-eminently render it the highly marketable commodity it is? Ask the fruit dealers. What method, what thoroughness is evidenced in these salient features!

Only trees in robust health can produce robust fruit; only freedom from injuries by pests can maintain that fruit unblemished. Do not believe it that there are no pests out there—witness the Acts for their suppression—but do believe they have spraying machines and use them. The spraying machine is as much a necessary item of the orchardist's "plant" as the plough or the cultivator.

And having grown fine clean fruit, how do they prepare it for market? Do they dump it into barrels, boxes, or baskets of unequal contenance: large, medium, and small fruits into the same package?

No indeed. It is all carefully packed—usually at the common packing centre—in clean packages of even size and equal contenance, and so packed that the top, middle, and bottom of the package holds fruit of identical quality. There is nothing the fruit-buyer appreciates more highly than honest packing. But to make this faithful packing possible the fruit must be all previously graded—you can't pack ungraded fruit—and carefully graded it is. Further, right through its history—on the tree, in the packing house, and before it is shipped—this fruit is inspected and inspected; the grower submits to, in fact courts, inspection, for he knows it is all part of that system of thoroughness which makes so much for his own well-being.

From the orchard to the market, system and organization control Colonial fruit—system and organization only possible when all concerned see eye to eye and work shoulder to shoulder.

Nowadays we frequently hear the expression "Scientific Fruit Culture." What is scientific fruit culture? I think, if the term is not too grand to apply to the methods whereby an industry is wrought at with success, we may justly characterize the methods employed in the Colonial fruit industry as "scientific."

Science is merely ordered knowledge: the knowledge evidenced in the production of the fruit we are discussing is surely well-ordered knowledge. Furthermore, it is not merely such knowledge as accrues from practical experience, but, to at least an equal degree, it is knowledge ready for use, bestowed upon those who use it directly by the veritable scientist. Botanist, biologist, pathologist, mycologist, chemist, and entomologist have each and all their share in bringing the Colonial fruit industry to the high position it holds, and they must all continue to bear a hand in maintaining it in that position. The State departments will see to it that the supply of pure science does not fail.

Certainly, I think, we may with justice say that the fruit culture I have endeavoured to describe is scientific fruit culture.

In passing let us note the attitude and feeling existing between the practical man and the scientist in Colonial horticulture. How does the man in the field feel towards the man in the laboratory? What is the attitude of the man of research towards the man of practice? Each believes in and upholds the other; each knows that he is the complement of the other. They are yoke-fellows in the same plough. The fruit-farmer appreciates the vast services the scientist renders him, and the man of science knows his efforts are only crowned with success in its finest form when their results prove of practical service to the farmer. Science is thus stimulated to fresh efforts, not only in the purely academic vein, but along the lines of economic utility. Can such a state of affairs be too vociferously applauded? How very patent here to-day is the outcome of it! What a power for good, what a lever to progress, does this happy attitude between science and practice constitute!

In this way, then—and there is something extraordinary about it—not in one alone, but in almost every one of the great British Colonies has a sound fruit-producing industry been built up. But a few of the Colonial States are represented by their products in the present

exhibition, but there is hardly one of the others, did the fall of seasons and other circumstances permit, who could not have put up an exhibit of fruit that would do credit alike to the exhibition and herself.

In the Eastern and Western Hemispheres, to the north and to the south of the Equator, wherever our great Colonies lie, there are to be found fruit-industries organized as I have indicated and achieving splendid results by methods such as I have endeavoured to describe.

Is there not something remarkable and striking in the generality of this thing?

We may now briefly recapitulate the means whereby our Colonial kinsmen succeed so thoroughly and so rapidly in building up their fruit-industries.

How, in the first instance, is it that there is such a bulk of uniformly fine fruit?

Because right back in the orchards we find that science and practice have worked hand in hand to evolve cultural methods that are uniformly correct and of the highest efficiency, and that these methods are uniformly adopted by all the growers in each fruit-growing district. For example, is a stock discovered which is blight resistant, or a variety of plant immune from disease, then all the trees are grafted on that stock or only the immune varieties of plants are planted. Is some system of pruning found to be better than a former system for tree or crop, then all prune upon that system. Is the soil of the district found to be chemically or mechanically unequal to the production of fruit of the highest possible quality, then the most efficient way of correcting the deficiency is sought and universally adopted. Does a pest or disease make its appearance in the settlement one and all unite to subjugate it; the thorough are assisted and the careless compelled by legislation to subjugate it. Thus is the fruit produced in important quantities of uniform kinds and quality.

When produced the question arises, Where is all this fruit to be disposed of, and how is it to be conveyed to markets when they are found for it?

Combined action meets both these considerations. As a combined body the growers are enabled to deal with the circumstances and employ means and agents which the single individual could not procure. And the combined efforts of the growers in this connexion are vigorously seconded by the State. All the advice and information that the State is so well equipped to acquire is placed at their disposal. Valuable products in important quantities, consigned in a practical manner, readily command the respect and best services of the carrying trade. Railways and shipping companies compete with each other for the carriage of such produce, and are constantly concerned in the improvement of their means of conveying the fruit to its destination in the best marketable condition.

Sound methods, combined action, organization, and State supervision, all seasoned with unremitting thoroughness, are collectively responsible for the Colonial fruit industry as we find it. While belauding this collectivism, however, we must not forget that collectivism can

only be effective when the individuals who compose the combined body each and all fairly and squarely do their part. Collectivism founded upon any other basis is futile. The day-dreams of the feckless and the idle are of a "collectivism" which must be futile. All praise then to the individual Colonial fruit-grower and to his coadjutors individually.

I hope, then, the question, How is it done? is satisfactorily answered.

Is it not clear that natural advantages—such as soil and climate—cannot be held responsible for the splendid object-lesson the Colonies are affording us. The best compliment we can pay our Colonial kinsmen, and at the same time the sanest course we can adopt for the welfare of our own fruit industry, is to accept the lesson and follow so fine an example. There is no insurmountable obstacle to our doing so, but there is one obstacle that must be surmounted before we are able to achieve what our Colonies have achieved.

No climate throughout the world is better abused than the British climate, yet I am afraid I must abuse it once again, and ascribe to it that one obstacle I refer to, because I do not know to what else it can be ascribed. There is, there must be, some micro-organism infesting the atmosphere of these islands which has a peculiar effect upon our population. It has the strange property of making a man infected with it quite incapable of believing that his business interests can be in any way identical with those of his neighbour, or that in combination with his fellow-man he can attain greater material advantages than he can achieve single-handed. This germ or microbe, or whatever it is, is evidently more prevalent or more virulent in the rural atmosphere than in the air of cities; for sure it is that the countryman suffers more intensely from the mental derangement caused by it than the townsman. Now that this germ is peculiar to our climate is obvious, since any man badly under its influence here has only to transport himself to other climes—say, to the Colonies—to be freed from its ill-effects. In other words, an Englishman who will carry individualism to the extreme point of his own undoing in his own land will go abroad and adopt in theory and in practice the principles of "combination" to his own vast benefit.

We must inoculate ourselves against this microbe—say, with a vaccine charged with the germs of common sense—and once freed from its influence the road is open to us to build up a fruit industry in the way and by the same methods that our Colonial kinsmen have built up theirs. Efforts have been made—honest efforts enough in their way—in this country to put the industry on a firm basis, but organization is lacking and there is no cohesion; and the microbe always intervenes.

The Colonies need never fear that after learning from them "How to do it" we shall enter into harmful competition with them. There are unlimited markets open for really first-class fruit, the supply of such fruit simply increases the demand for it, and the world's population is not standing still.

Hearty congratulations are due from us to the exhibitors in this show, mingled with gratitude for the object-lesson it conveys.

FIG. 167.—SAND-PEARS TRAINED ON "TANA," KAWASAKI, NEAR TOKIO.

FIG. 168.—OLD SAND-PEAR ORCHARD, KAWASAKI.
Trees trained on "Tana" and top-grafted.

(*To face page* 530.)

FIG. 169.—KAKI TREE, UNPRUNED, OVER 200 YEARS OLD, KAI.
(Height 24 feet.)

FIG. 170.—GATHERING KAKI FRUITS.

The fruits are not picked, but the sheet bearing a number of fruits is broken off at its base by means of a long bamboo rod.

THE PRUNING AND TRAINING OF FRUIT TREES IN JAPAN.

By T. Ikeda, F.R.H.S., Assistant Professor of Horticulture, College of Agriculture, Tokio.

Though favoured by natural conditions, almost every aspect of fruit-growing has been seriously neglected in Japan. Of our leading fruits, those which bear readily like citrous fruits, loquats, plums, apricots, and apples, have always been left alone without pruning and training. On the other hand, fruit trees which come late into bearing, or which, without proper attention, quickly degenerate, such as pears, peaches, and vines, have long received more or less pruning and training. Date plums are often pruned, but the majority remain of their natural shape and stature.

Our modes of training differ widely from those adopted by Western nations. The prevalent mode of training fruit trees is that called "tana-zukuri" (similar to "table cordons") for such kinds of fruit trees as bear on spurs as well as for vines (figs. 167, 168). It is a mode of training on overhead supports, and is mainly used for pears and vines, though apples and plums are often trained in the same manner. Peaches are also regularly trained nowadays. They require no support and form dwarf bushes. They receive some pruning every year, and are trained on the "open-centre" system.

Thus, a few kinds of fruit trees alone receive more or less pruning in a regular manner, while others grow quite untouched. Citrous fruit trees, loquats, date plums, cherries, apricots, ume trees, plums, quinces, chestnuts, walnuts, pears, and apples in some localities are left quite untrained.

It is not uncommon in our orchards to find that pears, date plums, chestnuts, and citrous fruit trees have acquired the habit of fruiting in alternate years. Such a state of things, the majority of our growers believe, is due to Nature, and uncontrollable by men.

Even if left quite alone, loquats, mandarins, and chestnuts make rather handsome trees, being regular in their modes of branching. But they bear in alternate years; and uniformity of size and quality of fruits are impaired in such unpruned trees.

Date plums, ume trees, apricots, and plums are of most irregular shapes (fig. 169). They have crooked stems straggling in a most curious manner. The trunks are often decayed and hollow in the centre, and this has long been admired as ornamental by some people. Such a diseased condition not only renders the trees worthless but is a menace to the welfare of other trees.

Strangely enough our gardeners have turned their attention to the pruning and training of ornamental trees, while the fruit trees are quite

neglected. Training trees as ornaments and the pruning of flowering plants have for a long period been practised by our gardeners. Their topiary work on ornamental evergreens, and pot-grown trees are notorious. Our people admire some fruit trees for flowers rather than for fruits. Gardeners have devoted their energies to raising novelties to meet the demand for them, and have neglected trees in regard to their pomological value. For example, flowering varieties of peaches, ume trees, and quinces are carefully cultivated, but fruit-bearing ones are comparatively neglected.

Such circumstances have not tended to increase our skill in fruit-growing, and have at least partly checked the progress of our orchard work.

Pears and vines are trained on a horizontal trellis made of bamboo canes supported on wooden posts (figs. 167, 168, etc.). Recently the bamboo trellis has been replaced with wire trellis in some localities (fig. 173). It is called "tana," and such a mode of training is called "tana-zukuri." The height of the trellis varies in different localities and with the kind of fruits, but generally it is about 5 feet 6 inches (equal to the average height of our adult man). Women and children can work at the trellis by the aid of ladders or high wooden shoes, which are very popular in this country.

In training on supports, as it is restricted to the tana-training, our growers, especially those near cities, have become very skilful. In a pear-growing centre in the vicinity of Tokio trees over a century old are grown by this system. The present system of training is recorded as having been practised by our forefathers. It has spread among growers throughout the country on account of the ease with which the material for the trellis is obtained as well as for the simplicity of the method. Bamboo canes, the principal material, can be got anywhere by every farmer and grower. It has long been the custom to grow them for the purpose of using the young shoots as spring vegetables and as windbreaks and for the protection of river embankments. Even the small farmers can obtain them cheaply.

Tana is constructed with long bamboo canes set about 1 to 2 feet apart crosswise, and fixed immovably with straw ties. A rather large amount of labour is required for their construction, but that does not much trouble the growers, since it is usual to make the trellis in the winter.

Young trees from the nursery are planted in a regular manner, and are manured and allowed to make their own growth for three or four years to enable them to root well. When the trees are fully established with a strong root system, the branches springing about 5 feet from the ground and growing erect are bent and fixed in position to the trellis with straw ties. Afterwards these shoots form the arms. Several shoots thus trained are fixed almost equidistant from each other. On each arm spurs and the like growths are readily made, while any effort to encourage their growth is quite unnecessary.

By these means, the arms being under similar conditions, it is easier to bring them into equal growth and fruiting condition than by

any other system, such as palmettes, cordons, etc. Moreover, the symmetry of the tree can be easily restored even when arms are lost by some accident, just as in fan-training.

Canes last for about five years, whilst straw fastenings have to be renewed every year during the winter.

Branches, shoots and fruit-spurs undergo renewal-pruning at times during the winter. In some parts, where trees are planted on rich, deep alluvial deposits, they are shifted and transplanted at intervals of four or five years, to check and moderate their over-luxuriance and improve their fruiting.

Besides repairing and tying new shoots on the trellis, light winter pruning is performed. Many growers do no summer pruning. Fruit-thinning, bagging and destroying insects are vigorously practised by them. Of late years poultry and sometimes pigs are driven beneath the trees to feed on insects and other vermin. In such cases some strong protection around the trees is of course necessary.

There are different ways of constructing the bamboo trellis. In the pear centres in the vicinity of Tokio the trellis entirely covers the plantation, whilst in orchards near Kyoto and Nara it is divided into long rectangles which run parallel to each other. Between these, long narrow spaces are left which are used as paddy fields (fig. 171). In the growing season of the rice the water stands close up to the roots of the trees, the difference of height between the tree crown and the water level being only one foot. The soil here is very clayey, and the roots of the pears remain near the surface. Consequently, the trees show signs of bearing while quite young, but they dwindle away some ten to fifteen years after they are planted. Thus, the trees begin to bear in the second year from planting, and growers let them fruit at this early period. They, indeed, desire to get some return from them as soon as possible. Shoots emerging beneath the trellis are all retained so as to have as large a yield as possible. Thus, the outlines of trained pear trees differ widely in the two districts of the east and the west. The relative merits of these two systems of "tana" are still open to discussion and disputed among growers. Besides pears, plums and vines can be properly trained by this system. Plums have been grown lately by this method in Terada-mura, near Kyoto. All fruit trees which bear on fruit-spurs can be similarly trained. By this mode of training it is clear that early and profusé bearing can be ensured, but only with light pruning.

In some parts of West Japan where pears are grown on steep hillsides, "tana" being made along the slope so as to cover the hillside, the leaf canopy covering the trellis protects the crop growing beneath it against heavy winds. In this case the fruiting portion is mainly found under the trellis.

Grapes, until recently, have been exclusively tana-trained (figs. 172, 173). The remarkable success of this method is seen in the growing centres of Katsunuma, Iwai, and other villages in Province Kai, and in the Katashita vineyard not far from Osaka. In the former, vines are planted wide apart at the rate of 40 trees to the acre, while in the latter

120 vines are planted to the acre. With so much space vines run freely on the trellis. Winter pruning, stopping, suckering, pinching or rubbing off surplus shoots, thinning and other operations are regularly performed (fig. 173). Owing to the vigorous habit of the vine wide space is given to its free growth. Long pruning answers well, and keeping the growth moderate makes the vine come sooner into bearing.

Lately, foreign modes of training have been adopted by the vine-growers who grow foreign varieties for the purpose of making wine or for dessert. Their comparative merits, however, are at present open to future discussion.

The system of tana-training has spread widely in this country, except in those districts where there is a heavy snowfall. In north-west Japan, where heavy snowfalls occur, trees are trained to an irregular standard, branching their arms above the normal depth of snow. In some parts the twigs are tied together before winter comes. Grape vines in these districts are always mulched in the late autumn to prevent the canes breaking.

Tana-training seems to have spread widely in virtue of the following merits:—

1. The convenience of management, harvesting, and control of pests.
2. The simplicity and durability of the construction.
3. The ease of bringing trees to the fruiting condition.
4. The cheapness and ease of obtaining material.
5. The prevention of damage by storms prevalent in Japan during late summer or at the approach of harvest.
6. To secure the maximum surface exposure to full sunshine.
7. To protect against heavy rainfall during the flowering period.

Situated in the usual course of storms which visit our islands several times a year, our fruit-growers have to protect their trees against serious damages. The heaviest storm is usually felt late in August or early in September. Fruit trees, particularly those without support, suffer from these storms not only by losing their crop, but by injuries which affect the next season's crop. The foliage of pears and apples near the seashore are covered with salt. This causes it to turn brown and drop prematurely, while the roots are still active. Buds for the next year are thus forced to expand and flower in consequence. Fruit sets but cannot grow, and the crop is rendered quite worthless. Thus it is not an uncommon event for the growers to lose part of their expected crop for the following year.

Peaches and nectarines have been cultivated for a long time with but little care as regards pruning and training, but during the past twenty years the methods of treatment have improved. Trees are mostly of dwarf bush form with an open centre. Still no summer pruning has been carried on.

Yearling trees are planted, or stocks previously planted are grafted or budded. When planting, the tap roots are removed. Water-sprouts and suckers remain unpruned in the first winter, whilst strong

FIG. 171.—YOUNG SAND-PEAR ORCHARD NEAR NARA.

In the open ditches between the rows of trees rice is grown in summer. The water then rises much higher than is shown here.

(To face page 584.)

FIG. 172.—THE GRAPE-GROWING CENTRE AT IWAI-MURA, KAI.

FIG. 173.—'KŌSHŪ' VINE AFTER WINTER PRUNING.

The long canes running on the trellis will fruit in the next season. They are borne on the thicker long "arms," also trained to the trellis. Note the wire trellis.

FIG. 174.—SUN-DRYING KAKI FRUITS, KAI.

FIG. 175.—KAKI TREES IN FULL BEARING.
The fruit is always carried long after the leaves fall in November.

growths are trained in position, bending them down with straw lines to keep the centre spreading and open. Bending the shoots is carried out according to the vigour of the shoot. Thus the growth of the shoots being regulated, an equilibrium of growth can be secured with ease. These modes of training which aim mainly at early fruiting, though simple and imperfect from the ornamental point of view, seem to answer the purpose of our cottage-farmers or small-growers.

Citrous fruit trees and loquats are left alone, the only treatment they receive being manuring, mulching, cultivation, and rarely spraying. But they produce immense crops in alternate years. Lately, our veteran growers have learnt the necessity of pruning for the well-being of the tree, and they practise this work in some parts.

Kaki has until recently been the chief among our orchard fruits. It has been a most popular and widely cultivated fruit for a long time; but its cultivation under rational treatment is of quite recent growth. Sweet varieties are used for dessert, but astringent ones only become eatable when sweetened by curing or some other process. Cured products are still in great demand in our markets. The process of curing is as follows: Each fruit is pared and sun-dried by being suspended on straw lines (fig. 174). To facilitate this process, a bit of shoot is allowed to remain attached to each fruit stalk like the letter T, and by this the fruiting shoots are of necessity broken with the fruits. This process of breaking the shoots has by chance become a mode of pruning (fig. 170). Far better results have always been obtained than when the fruit alone is gathered. Growers became well acquainted with this fact, and have adopted the process. In Tono-o-mura, a date plum region between Kyoto and Nara, an expert named Tajuro Yoshioka has independently brought about the same process and succeeded in renovating worn-out trees in his village. His first method does not differ from the process already practised in other localities. By this method every fruiting shoot is broken at its base, while the sterile or non-fruiting ones are left unpruned, and new vigorous shoots start from buds of the remaining part the next spring. They do not fruit in the same year, but they grow vigorously and develop plump and well-matured buds on the apex as well as in the leaf-axils. These buds, especially a few near the top, always start fruiting shoots in the next year. On the contrary, if the fruiting shoots are left unpruned after the fruit is gathered, being exhausted they give weak, slender sterile shoots in the next spring, and sometimes they perish, worn out by the overwork of fruiting. Next year again, if these weak shoots are left unpruned, worse results would follow. In this way, when no pruning is done weak shoots grow in turn near the apex of the preceding ones, until at last the tree abounds in weak and valueless shoots (fig. 169). Fruits borne on such shoots are worthless or liable to drop prematurely. In some varieties, for example "Zenji-maru," the pistillate flower always appears on the stronger shoots, whilst the staminate ones are always borne in clusters on weak, slender shoots. Thus it is necessary to get the strong shoots by means of pruning (breaking) worn-out shoots, to increase the yield,

and make the tree growth profitable. Trees present in this case a typical weeping appearance, and differ greatly in this respect from those grown under regular pruning. YOSHIOKA's first method of pruning (breaking) shoots is nothing short of the spur-pruning of the fruiting shoots, and quite similar to that commonly practised on the fruiting canes of vines grown under glass.

The Kaki tree is similar in habit of fruiting to the vine. It bears in the leaf-axils of rather strong shoots of the current year growth, which start from a few well-matured plump buds near the apex of the mother shoot. That is, flowers are borne at most on the four nodes, from third to sixth from the base of the shoot. Weak, spur-like shoots are always sterile, while gross shoots of excessive vigour also have no fruit. Generally speaking, well-matured shoots of moderate length which have been sterile in the current year only are able to start fruiting shoots in the following year. Thus, we have to depend only upon the well-matured shoots, and try to produce such shoots as much as possible. For this reason renewal pruning, or at least the breaking of shoots, is of significance in the successful growing of Kaki trees (fig. 176).

Lately YOSHIOKA has brought out his second method of pruning by which better results have always been obtained (fig. 177). It consists of breaking the mother twig from which several fruiting shoots start. It differs from his first method only in severing the system of those shoots, not every fruiting shoot. By this process shoots starting from the remaining parts grow more vigorously, and improved results are always obtained by this severer process than by the earlier method.

By these means the habit of fruiting in alternate years is not corrected, but thinning fruit answers as a corrective of this habit and causes the trees to bear uniformly every year.

Near Tokio there are among its growing centres two villages, Komae and Noborito, which have long since co-operated in a curious manner to lessen and regulate the yield in order to avoid a glut in the market. Owing to the over-supply of fruit in the fruiting year no one can sell at a profit. To overcome this difficulty one of those villages practises the removal of the flowers while young in the fruiting year, and thus causes an off-year to be fruitful in an artificial manner. By this means Kaki trees in these villages bear in alternate years. Thus, the fruit supply in the market being well regulated, a glut can be avoided.

This practice seems to have derived only from considerations of individual economy of the grower, but not from the co-operative idea of the villagers in both places.

It has long been said among our people that Kaki trees dislike pruning by a knife or iron tools. This erroneous idea has spread, and is still common. The idea seems to have sprung from the fact of the slow healing of wounds in the root, as well as from the brittleness of the shoots. They are indeed liable to suffer from severing of the roots in particular. I have, however, had an opportunity of practising knife-pruning, and have succeeded in getting handsomer trees than by breaking the shoots.

THE COOKING OF VEGETABLES.

By C. Herman Senn.

[Read December 6, 1910.]

There was a time when England had a rather bad reputation in the matter of cooking vegetables, especially potatos and cabbages and other green vegetables, but of late years great progress has been made in the preparation and cooking of all kinds of vegetables for the table. That there is still room for improvement is shown by the fact that many excellent vegetables are cooked in such a manner as to render them either indigestible or tasteless for want of greater care and attention to the rudimentary principles of cooking. As our taste in cookery generally has vastly improved, vegetables are gradually receiving their proper attention on the part of the cook.

Vegetables, like other articles of food, can only be rendered fit for consumption by cooking, yet the changes which various foods undergo during the process and the losses which are brought about by it have been little studied. The question has a wide practical application as well as considerable scientific interest. In order to determine the nutritive value of various articles of food used, digestibility should be of the first consideration. Perhaps no feature of the subject has been more widely discussed of late than this. Yet very few experiments with man to determine the digestibility of various foods, and especially vegetables, have, as far as I am able to trace, been made. Almost all information has been derived from artificial digestion experiments which approximate more or less closely to digestion in the body. It should, however, be remembered that it is by no means certain that the two processes would give identical results.

With regard to the effect of cooking on the nutrients of vegetables and other foodstuffs, we must bear in mind that some albuminoids are soluble, and nearly all are soluble in dilute saline solutions. Heating coagulates the albuminoids and renders them insoluble. Careful cooking, therefore, also acts as a retainer of albuminoids. If meat is put into cold water and then brought to the boiling-point, more or less of the albuminoid material will dissolve, and some of the most valuable part of the food is lost unless the liquid in which the food is cooked is also utilized. If put directly into hot or boiling water, the soluble albuminoids on the surface will naturally coagulate, and this loss is thereby almost prevented. This principle is in a great measure applicable to vegetables.

Besides rendering soluble albuminoids insoluble, cooking makes others of the nitrogenous substances more digestible, and in the case of meats the fibres of connective tissues are loosened and so rendered tender and more palatable.

The latest aim in cooking vegetables is to cook them so as to pre serve certain nutriments which have hitherto been wasted. It i claimed that by the old methods the soluble salts contained in gree vegetables are lost in boiling; and the only way to prevent this is t utilize the liquid in which the vegetables are cooked. The waste is i the saline constituents.

I have been told that the ancient inhabitants of India used to coo most of their food in vegetable-juice, because they thought so muc of the nourishment found in the liquid. This method—to some exten at any rate—is sound in theory, and there is no doubt that a goo deal of nutriment is wasted in the cooking of all kinds of foods fo want of better knowledge. The chief aim in the newest methods o vegetable cookery is that not only the salts, but also the organi matter, much of which is lost by the older methods, should be as muc as possible preserved.

The most common methods of cooking vegetables are boiling steaming, stewing, frying, baking, and braising. With but few excep tions all green vegetables should be cooked in boiling water, whic must be kept boiling all the time to preserve the colour. They mus be thoroughly drained when cooked and then dished up. It is of cours essential that the vegetables to be cooked should be properly washed an cleansed, and whenever possible they should be cooked on the same day Long soaking in water is not to be recommended. Strongly flavoure vegetables, such as cabbages, should be cooked in plenty of water The late M. Alexis Soyer strongly advised that all green vegetable should not be boiled in hard water, which, he says, shrivels them up and in it they take much longer to cook than in soft water.

From a health point of view vegetables in some form or anothe should constitute an important item in every day's dietary.

Boiled Vegetables.—The principal rule for successful vegetable cook ing is absolute cleanliness. Next to cleansing and preparing for boiling the addition of sufficient salt to season the water, which must b boiling sharply and enough in quantity to well cover the vegetables. I is not advisable to soak cleansed and prepared vegetables for any long period in cold water prior to cooking, for this immersion causes some o the salts to be lost. Cabbage, turnip-tops, Scotch kale, broccoli, Brussels sprouts, and other green vegetables, French beans, scarle runners, green peas, cauliflower, carrots, turnips, parsnips and vege table marrow are among the most popular vegetables which should b cooked in boiling and salted water.

Special attention must at all times be paid to the cleansing, picking or peeling, and washing of all vegetables to be boiled; it is well to soak the prepared vegetables for about an hour in cold salted wate to free them from impurities. Certain green vegetables require to b washed and rinsed in several waters—especially spinach, sorrel sprouts, and greens—to ensure that they are free from grit.

There are two methods of boiling spinach. One is to cook the spinach in a saucepan with a quantity of water; when done, drain it and rinse it in cold water, then drain again and chop it finely or rub it

FIG. 176. OLD KAKI TREES.

The trees fruited in the summer, and all the fruiting shoots have been broken. The trees in the foreground are mulberries; that on the left is the wild pear, *Pyrus Calleryana*.

FIG. 177.—KAKI TREE.

From shoots grown in the last year, after breaking their mother shoots new growths are sprouting in the spring. These form the fruiting shoots of the year.

through a fine sieve. The other way is to steam the spinach and use little or no water. It is claimed that the less water used the better will be the result. Most cooks boil green vegetables in an open sauce pan. If they are put on in boiling water and kept boiling sharply till cooked tender it will ensure a good colour being retained.

Once boiled, vegetables must be carefully and thoroughly drained and dished up neatly.

THE ORIGIN AND HISTORY OF OUR GARDEN VEGETABLE AND THEIR DIETETIC VALUES.*

By Rev. Professor G. Henslow, M.A., F.L.S., V.M.H.

III.—Green Vegetables.

Asparagus.

Asparagus officinalis, L., is a native on the coasts of Wales, Cornwal and Dorset, but is rare. It was well known to and cultivated by th ancients. Pliny devotes a chapter to its cultivation, mentioning tha the dead stems were burnt down, the ashes being thus restored to th bed. All writers, from Pliny to Parkinson (seventeenth century), allu more to its supposed medicinal virtues than to its use as an article diet. Dodoens figured it in 1559, and all subsequent herbalists have als done so. He adds, "The shoots are boyled and eaten in salet with oyl salt and vinegar." To this Gerard (1597) adds: "Sodden in fles broth."

At the present day, in the southern parts of Russia and Polan the waste steppes are covered with it, and it is there eaten by hors and cattle.† With regard to the chemical analysis of asparagus Professor Church found 89·8 per cent. of water, 3·0 per cent. albuminoids, 5·9 per cent. of sugar, etc. Hence the nutrient rati is 3·0 : 5·9, the nutrient value being 9·3.

"French" Asparagus.

A plant, the spring shoots of which, consisting of the inflorescenc in bud, are sold in the markets of Bath under the above name. It botanically known as *Ornithogalum pyrenaicum*, L. It occurs woods and copses of southern counties. It is allied to the "Star Bethlehem" (*O. umbellatum*, L.), a naturalized wild flower. Th present writer considers it very insipid.

Aubergine or Egg-plant.

This is known botanically as *Solanum Melongena*, L. It has lon been known in India, but not in Europe until the close of the sixteent century. In North Africa it was known in the ninth century, and now cultivated throughout the Nile Valley (De Candolle). It is not s commonly used in England as on the Continent. It is eaten cooke

Broad Bean.

This was called *Vicia Faba* by Linnæus, but is now better know as *Faba vulgaris*, Moench. After an exhaustive examination of all th

* Previous articles in this series have appeared as follows:—Vol. xxxiv pp. 15-23; vol. xxxvi. pp. 115-126 and pp. 345-357.

† *Treasury of Botany*, s.v.

localities recorded of its being wild, De Candolle's conclusion is that the origin is not known. The Greeks of old called it *kuamon*. It was found in the excavations of Troy; and "it was an ancient Roman rite to put beans in the sacrifices to the goddess Carna, whence the name *Fabariae Calendae*." A small bean has been found in the remains of the Swiss lake dwellings of the Bronze Age. It resembles a variety still cultivated in Spain. It was well known in Egypt; but Herodotus says, "The Egyptians never sow the bean in their land, and if it grows they do not eat it either cooked or raw. The priests cannot even endure the sight of it: they imagine that it is unclean." The explanation probably is that it was only cultivated by the poorer classes as the bean existed then in Egypt.

In II Samuel xvii. 28 and Ezek. iv. 9 the word "pol" occurs, and is translated "bean," as the Talmud maintains it to be this, the Arabic word *fol* still signifying the bean.

De Candolle suggests that *Vicia narbonensis*, wild in the Mediterranean basin, north of Persia, and Mesopotamia, may have been the origin of our cultivated plant, as it most nearly resembles it. The reader is referred to the kidney, French, or haricot bean for the dietetic values of these plants, as Professor Church does not specify that of the common or broad bean.

Kidney or French Bean.

Phaseolus vulgaris, L. var. *nanus* (sp. L.), if not the dwarf kidney bean, is something like it, and was cultivated by the ancient Greeks. Dioscorides describes it, a figure being added to a manuscript of the fifth century now at Vienna under the Greek name, "Phasioli"; Dr. Daubeny pronounces the illustration to be "very good." According to Liddell and Scott's Lexicon, Aristophanes (fifth century B.C.) is quoted as referring to it; and a light boat was also called "phaselus," "probably from its likeness to the pod." From this we might infer a long history of the kidney bean in Greece. But was it not a species of *Dolichos*?

Bentham and Hooker place *Dolichos* the sixth in position from *Phaseolus* in the tribe "Phaseoleae." The leaves in both are three-foliate. The pods are linear or falcate, the flowers various in colour. Pliny observes: "In the case of the kidney bean, it is usual to eat the pod together with the seed." Turner (1548) says of "*Phasiolus* otherwise called *Dolichos*; it may be called in Englishe, 'Large peasen or favelles.' It is in great plentie about Pauia in Italy."

Dodoens (1559) gives a figure of the dwarf bean, the pods hanging from the axils of leaves immediately above the root. This he called *Phaseolos* and *Dolichos* (Greek), *Smilax hortensis* (*Latin*).

Matthiolus, in his commentary on Dioscorides, gives a good figure, observing: "*Phasioli* are common in Italy in gardens and frequently in fields. There are many kinds, distinguished by their various colours, white, reddish, black, and spotted"—evidently referring to the seeds.

Gerard (1597) illustrated four kinds of *Phaseolus* and two of *Smilax*; but it is difficult to recognize our *P. vulgaris*. Johnson in his edition of Gerard (1636), adds others from Clusius, such as *P. peregrinus*,

fructu minore albo, which he describes as follows: "The stalk of this is low and stif; the flours are of a whitish yellow on the outside, and of a violet colour within; the fruit [seed] is snow white, with a black spot in the eye. This is *P. peregrinus*, 4 of Clusius." It seems to correspond with the haricot. This name is derived from the Italian *Araco*, given to a common field weed of Southern Europe, known as *Ochrus*. Johnson adds that Clusius obtained his sorts from "the East and West Indies." Lastly, after a long investigation into the history of *P. vulgaris*, A. De Candolle sums up as follows: "(1) *P. vulgaris* has not been long cultivated in India, the south-west of Asia, and Egypt; (2) it is not certain that it was known in Europe before the discovery of America; (3) at this epoch the number of varieties suddenly increased in European gardens, and all authors commenced to mention them; (4) the majority of species of the genus exist in South America; (5) seeds apparently belonging to the species have been discovered in Peruvian tombs of an uncertain date, intermixed with many species, all being American." An interesting paper * upon the seeds and tubers found in the Peruvian tombs (the date being from the twelfth to fifteenth centuries) fully confirms the fact that *Phaseolus vulgaris* and the varieties *oblongus* and *ellipticus*, of various colours, were cultivated in Peru long before the Spaniards entered South America.

Scarlet Runner Bean.

Phaseolus multiflorus (Lim. *P. vulgaris* var. *coccineus*) is a native of South America, and was introduced in 1633, according to Paxton. Linnæus (1764) refers to two botanists, who wrote of it—Jakob Coruntus and Morison, both of the same century. It is figured by Parkinson (1640) as "*P. Indicus, flore coccineo*, the Scarlet flowered *Frenche* beane." He adds that "it grew in the West Indies, and was first grown by Mr. Tradescant," the gardener to Charles I. He died about 1652.

The amount of nutrition in haricot and French and scarlet runner beans may be assumed to be much the same. Professor Church says that the *pods* contained 91·8 per cent. of water, 0·64 per cent. of mineral matter, and 2·02 of true albuminoids. The beans contain 23 per cent. albuminoids, 52·3 per cent. of starch, &c., and mineral matters 2·9 per cent.; the nutrient ratio being 1 : 2·5; the nutrient value, 80.

Lentils appear to be the *most nutritious* of all vegetables as regards the quantity of *nitrogen* present, the albuminoids amounting to 25 per cent., while the starch is 56 per cent.

To supply a convenient standard among underground roots for the *carbonaceous* qualities, the Potato may be taken, for this has only 1·2 per cent. of albuminoids, but 18 per cent. of starch.

Cardoon and Globe Artichoke.

These two plants were formerly regarded as distinct species, *Cynara Scolymus*, L., and *C. Cardunculus*, L., respectively; but now they

* "Sur les Graines et Tubercules des Tombeaux Péruviens de la Période Incasique," par MM. Costantin et Bois, *Rev. Gén. de Bot.* vol. xxii. p. 242.

are considered varieties of the same plant, a native of South Europe and North Africa. Indeed, Linnæus quotes Bauhin as saying that the latter will spring from the seed of the former.

Parkinson (1629) appears to be the first to call the Cardoon *Carduus esculentus—i.e.* "edible thistle"—though it is recorded as having been introduced in 1658 and cultivated in Holyrood Palace Garden in 1683. "It has been more cultivated on the Continent than here. The only parts eaten are the inner leaf-stalks and the top of the stalk called the receptacle of the florets when blanched and used in stews, soups, and salads." It is one of the European plants which has spread to an enormous extent over the prairies of South America.

Dioscorides uses the word *Kinara*, and Pliny *Scolumos*, which he also calls *Limonia*, and classes it among thistles. He is probably referring to the Cardoon in saying, "There is one plant the cultivation of which is extremely profitable and of which I am unable to speak without a certain degree of shame; for it is a well-known fact that some small plots of land planted with thistles (*scolymos*) in the vicinity of Great Carthage, and of Corduba more particularly, produce a yearly income of six thousand sesterces [about £26], this being the way in which we make the monstrous productions even of the earth subservient to our gluttonous appetites, and that, too, when the four-footed brutes instinctively refuse to touch them!" Pliny also says it has numerous medicinal virtues. In his "History of Plants," Dodoens describes three kinds of *Scolymus*, or "wilde thistle"; one, he says, "might well be called *Carduus asinus*—that is to say, Asse thistell." In his plates (1559) he figures both *Scolymus*, or *Cinara*, as *Articoca* of Italy, and *Cinarae aliud genus* as the *Chardons* of Italy. He describes it as much more spinescent and less used as food.

Gerard (1597) gives a good figure of the Artichoke (3 inches in diameter), which he calls *Cinara maxima anglica*, "the great red Artichoke." A second differing but little is the *C. m. alba*. A third, *C. sylvestris*, or "wilde Artichoke," is much more spinescent, and is called *Cardino* by the Italians, *Chardon* by the French, from the Latin *carduus*; hence Cardoon.

Parkinson (1640) alludes to a statement of Theophrastus (fourth century B.C.) that "the head of Scolymus is most pleasant, being boyled or eaten raw, but chiefly when it is in flower, as also the inner substance of the heads is eaten."

Tournefort (1730) says: "The Artichoak is well known at the table. What we call the bottom is the *thalamus* on which the *embryos* of the seeds are placed. The leaves are the scales of the empalement. The Choak is the florets, with a chaffy substance intermixt. The *French* and *Germans* boil the heads as we do, but the *Italians* generally eat them raw with salt, oil, and pepper."

This author seems to refer to the "scales" as being eaten as well as the "bottom," but does not say when the former were first used, though the word "choak," or, as we would quote it, "choke," is appropriate for the pappus, or "chaffy substance," but the name

'Artichoke" is really a corruption of the Italian *Articiocco*, itself a corruption of the Arabic *Al harshaf*.

The "receptacle" has a delicate flavour, but contains little nutritive matter.

Celery and Celeriac.

Celery in ancient times was regarded as a kind of parsley, under the name *Paludapium*, *i.e.* "Marsh Parsley," being a more or less aquatic plant. The Latin name *selinon*, adopted from the Greek, is mentioned by Lucius Appuleius (163 A.D.). This gave rise to the Piedmontese Italian *seleri*, and thence to the English words.

In the Middle Ages it was called Merche and Smallage, but *Apium* by the apothecaries and herbalists, being much used in medicine. In the Eastern parts bordering the Mediterranean the foliage is used for flavouring, as in Malta, Italy, and the Levant, but never blanched. It was only used medicinally in the sixteenth century; for Gerard says: "This is not woonted to be eaten, neither is it counted good for sauce."

Parkinson (1640) observes: "It is not to be endured to be eaten alone, but, being boyled and otherwise dressed, it favoureth better." But he seems only to signify its use as a drug, and not as food. It appears to have been first blanched about 1670; for Sharrock in his book on vegetables devotes a section to the "Blanching or Whiting of Sallad Herbs," such as the succories, &c.; he does not specify the celery; but Salmon in his "English Physician" (1693) writing on the virtues of *Apium palustre*, says: "It is either of the marsh, called by the common name Smallage, or of the garden (made white and crisp by laying earth upon it), called Sallary, as being used for a salet-herb." In Wheeler's "Botanists' and Gardeners' Dictionary" (1758) it is said: "A variety of it, called the Smallage, is seldom cultivated in gardens. But there are two sorts found in the gardens, distinguished by the names of the Italian Celleri and the Celleriac."

Miller, in his "Gardeners' Dictionary" (1771), says: "The fourth sort is commonly known by the title of Smallage. This is what the physicians intend when they prescribe *Apium*. This plant grows naturally by the sides of brooks and ditches in many parts of England, so is rarely cultivated in gardens." He then describes the fifth sort as *Apium dulce*, the upright Celery, and *A. rapacium*, the Celeriac or turnip-rooted Celery. It should be remembered that the wild and green plant is unwholesome, if not actually poisonous, but when blanched all suspicious qualities are prevented from arising. In Malta to-day the green tops are alone used, boiled, as the Maltese do not blanch the leaf-stalks.

There is not much nutriment in Celery, as there is over 93 per cent. of water. The chief constituents are sugar 2 per cent., and starch with mucilage 1·6, the mineral matters being 0·8 per cent. The nutrient ratio is 1 : 4·5, and the nutrient value less than 5.

Chard.

We have seen under Beet that in ancient times and up to the sixteenth century only the leaves were eaten, and that it was not till the close of the sixteenth century that the root became an article of diet. With regard to Chard, I extract the following succinct account from Mr. Booth's article in the "Treasury of Botany." "The large white or Swiss chard Beet (*B. cicla* var.) is a very distinct variety, remarkable for the thick midribs and stalks of its large upright leaves. It is the *Poirée à Carde* of the French, with whom it is a favourite vegetable served as asparagus."

Fig. 178.—Swiss Chard or Spinach Beet (Burpee).

The illustration (fig. 178) is a peculiarly interesting form of Swiss Chard or "Spinach Beet" sent out by Mr. W. A. Burpee, Philadelphia. He calls it *Lucullus*, and describes the leaves as follows: "The leaves are sharply pointed, the texture is heavily crumpled or 'savoyed' . . . the leafy portion of the foliage is served as spinach, the stalks being served separately."

(*To be continued.*)

VARIATION AS LIMITED BY THE ASSOCIATION OF CHARACTERS.

By A. Worsley.

I have experimented with several fertile hybrids and analysed th variations which take place in the ensuing generations, and in most c these experiments I found that the hybrids and their self-fertilize progeny are means between their parental extremes, although ther are instances in which one parent influences the hybrid and its progen to an extent exceeding that of the other parent. Now if we take on (suppositious) case and note eight divergent characteristics between th parents (*inter se*), we shall probably find that the hybrid holds a strictl equipoised position as regards the bulk of these characters, but ma incline towards the female in some and towards the male in others To reach this result it is not enough to examine the first few individual of the hybrid race that come into flower, but we must wait until th whole of them have flowered and until a critical analysis of them al can be made.

To be sure of our ground we must also apply this analysis to th whole of those characters in which the parents differ *inter se*, and no merely to some of them. For if we submit a hybrid to an incomplet analysis we may conclude that the male is dominant, simply becaus we have taken no count of those other characters in which the hybri inclines towards the female.

In the succeeding generations of self-fertilized plants we shall not some variation from the equipoised hybrid type. This variation may b great or small, and follows no known law. For instance a true new species may result from hybridization, such being the case when the subsequent variations from the hybrid type do not exceed about 3 per cent., and when the preference of individuals for the pollen of other individuals (in bi-sexual flowers) is sufficiently strong to ensure the breeding out of these variant characters. I have had no personal experience as to whether new species can be artificially produced by hybridization among those bi-sexual plants which are normally self-fertilizing.

When I have followed these hybrid progeny by critical analysis into the second and subsequent generations I have not been able to satisfy myself that reversion to certain specific characters follows the allegations of the Mendelian advocates. In the first place I have never been able to find in hybrids any characters that were absolutely dominant or recessive, but have only discerned a certain relative or partial inclination towards the specific characters. Nor have I as yet found a single instance of absolute reversion to either specific type; but I have found

that, in the subsequent generations, all sorts of intermediate forms crop up equipoised between the hybrid type and either parent. For instance, if the hybrid type inclined towards the male in colour of flower and towards the female in another respect, I find that some individuals in subsequent generations will do just the opposite, as though the law of change indicated a course of variation which would in time fill up every gap between the two extreme forms represented by the species originally crossed.*

But to this consummation there is the evident bar of the association of different † characters. We constantly find that certain pairs of characters cannot be dissociated from each other, but continually occur together in individuals. This association of certain characteristics (so long as it obtains) appears to rule out the possibility of the occurrence of certain conceptually possible intermediate forms. The Antirrhinums give us one instance of this, for among the dwarf self-coloured forms every rogue as to height is also a colour-rogue, whereas those that are typical in stature will probably not produce 1 per cent. of colour-rogues.

If we define a species as "A group of closely related individuals as between whom procreative variation has suffered a temporary and partial arrest," we mean by this definition that we reserve the use of the term "species" to plants which reproduce themselves true from seed with the number of variants limited to (say) 3 per cent. But this, again, may mean no more than that the association of characters has been so extended as to include all the noticeable characteristics of the type. In this sense variation becomes a question of permutations and combinations, and in every "good" species all the characters hang together so that variation is brought to a standstill for the time being, or reduced within very narrow limits.

By hybridization this fixity is broken up to some extent, or, in a few cases, a new set of associated characters supersede the old associations. Now if the hybrid is crossed with another hybrid, greater variation becomes evident, until in florists' plants we note an ever-growing inconstancy.‡ All this hypothetical fixity in "good" species is, however, relative and not absolute. There exists a certain percentage of variants from the type, and I contend that we cannot foretell with certainty the trend of such variation. For as the germ-plasm

* As an example, I hybridized *Hippeastrum vittatum* with *H. equestris* and produced the hybrid *H.* × *Mandevillei*, which showed some inclination towards the female. There are eight divergent characters as between the species *inter se*, which I designate a b c d e f g h, or A B C D E F G H, using small letters if the characters of the second generation resemble those of the female species, and capital letters if resembling the male species. Now the Mendelian assertion of recessive characters would produce variants as they are here written (above); but I have found none such. The hybrid type produced a b $\frac{c}{2}$ $\frac{d}{2}$ E F g h and the variants of the second generation such formulæ as A b $\frac{c}{2}$ d e f g $\frac{H}{2}$, &c.

† The word "diverse" might here be understood in the sense in which it has been used above. So I have not used this word here.

‡ See my *Concepts of Monism*, "On Species," p. 335, &c.

of every plant contains within itself immeasurable possibilities of reversion to all or any of its ancestral characters, however remote, it is clear that the apparent fixity of any species is a something bounded by time and conditions. For the time variation is bounded by the association of certain characters, but how or when this association will be broken, or what variation or reversion may then ensue, cannot be foretold.

This question of variation depends entirely on parentage, and could probably be determined with some exactitude if the ancestry of any plant was known. But inasmuch as the complete ancestry of no plant can ever be known, and is in fact an impossible thought, all we can do is to imagine that the earliest-known ancestors of plants with which we deal possessed characters absolutely fixed and invariable, and from this false basis to deduce certain mathematical ratios of probable variation. On this assumption we may declare that a proportion will revert to one parental type, a proportion to another, and that such reverted individuals will have re-attained the same measure of fixity that their parental types possessed. This has been known for a very long time in a general way, and all the Mendelian advocates claim is that in certain already tested cases they now know in what ratio such reversions will occur; but they do not claim that this ratio is applicable in any general sense. My own experiments teach me that we can only reach an approximation, not any precisely known result; and that in different hybrids and cross-bred plants these results also vary, and are in great part dependent on the association of characters, and these again on pre-existing associations in their ancestors.

Instances of Linked Characters.

[From my own observations.]

(1) *Chrysanthemum.*—In *C. indicum* the flowers are small and yellow; the leaves small and permanently * glaucous on both sides; and the coloured bracts are markedly tri-dentate. *C. indicum* is held to be one of the progenitors of our garden chrysanthemums. I have raised seedling chrysanthemums from several sources, and have noted that the bulk of garden seedlings revert towards this wild type and are inferior to the average of garden forms propagated by cuttings. Amongst these partly-reverted forms some will always be found to have reverted in a very marked degree, and these latter plants will show a very large predominance of yellow-flowered forms. If these small yellow-flowered forms are examined it will be found that they have reverted to the specific type not merely in the respect of colour and size of flower, but also in the permanently glaucous foliage and in the tri-lobate margins of the coloured involucral bracts: thus showing that the tendency is for these three characters to remain associated in mongrel progeny. Of course if these seedlings were true reversions to the specific type—that had reverted *in toto*—this instance would in some senses fail to help my argument, but the cases I have observed

* That is, are glaucous in the young as well as in the mature stage.

were instances of comparative, not of total, reversion, and the plants still held an intermediate position between the garden race of chrysanthemums and the reputed specific ancestor.*

(2) *Hymenocallis.*—Seeds of *Ismene amancaes* are deep shining green, and smaller. Seeds of *Ismene calathina* are light glaucous grey-green, and larger. Seeds of *Ismene sulphurea* are intermediate in colour and size. Now, although the seeds of the hybrid are distinguishable from those of *Ismene calathina* by their darker colour, the reverse is the case with regard to the foliage, for the leaves of the albino are much darker green than either of the yellow-flowered forms, and it is a more robust grower. Here yellow in the perianth is associated with dark green seeds. Here white in the perianth is associated with dark green leaves.

(3) *Papaver.*—In the "Shirley Poppy"—a garden race—the beautiful orange-flowered forms can often be picked out from the crimsons at an early stage by the comparatively light or yellowish-green colour of their foliage.

(4). *Hippeastrum.*—In the garden race of Hippeastrums, those nearest *H. vittatum* in colour and markings of perianth have *more flowers* than the purely red forms; the former generally four to five flowers, the latter usually two. In *H. vittatum* (true) it is usual to find four to five, six, or even seven flowers, and although I have occasionally seen red hybrids with as many flowers, yet the garden forms of to-day have usually two and never more than four flowers to the umbel. Here the colour and markings are correlated with the number of flowers to the umbel.

(5) *Capsicum.*—The case of the red and yellow Capsicums is also interesting. I do not claim to have tasted every variety or alleged species of *Capsicum*, but I have tasted a great number, and I have invariably found that the "hot" tasting properties associated with cayenne pepper are confined to those Capsicum fruits which have pointed apices, the degree of heat varying inversely with the size of the fruit, the smaller being the hotter.† Conversely, those fruits with blunt apices are known as "mild" Capsicums, and among these mild fruits the degree of mildness varies with the size, the largest being the mildest.‡

(6) *Matthiola.*—There is also an interesting instance of the association of characters well known to florists, and of great use to them in enabling them to pick out with tolerable accuracy the double from the single forms of garden stock [*Matthiola* species and mongrels]. For the single forms are more robust, possess a more intense shade of green in the growing crown of foliage, and have rounded apices to their relatively wider leaves. Conversely, the individuals which will produce double flowers are not so robust, possess a yellowish-green (or lighter green) shade in the crown of foliage, and have more pointed apices to their relatively

* Plants of these partially reverted forms have been exhibited before the Scientific Committee of the Royal Horticultural Society, in October 1908, and on other occasions previously.

† As an instance, "Pointed or long Calabrese" of the larger hot varieties, and the true "Short Cayenne" of the shorter.

‡ As an instance, "Columbus" of the largest mild varieties.

narrower leaves. In addition, the edges of their leaves are usually curled, and the leaves forming the heart are whitish and incurved so as to completely enclose it. Moreover, the double forms possess more distinctly hairy foliage than the single forms. It is said that M. Chaté first tabulated these differences. He also tells us* that the Erfurt growers claim to be able to foretell which plants will be double from the abnormal shape of the seeds of the parent.

(7) In the Amaryllea solid peduncles are associated with light coloured,† bulbous seeds in seventeen genera, whereas hollow peduncles are associated with black seeds, generally ‡ flat or nearly so in twelve genera.

Out of the thirty genera which I have examined, twenty-nine adhere to this rule of association.§ The only exception in the genus *Pancratium*, which is characterized by a solid peduncle in conjunction with black, bulbous seeds. Perhaps some other exceptions may exist in genera which are rarely grown or seeded under cultivation.

Instances of Linked Characters.

[Drawn from other sources.]

Hugo de Vries, in his book *Plant Breeding*, gives a number of instances of correlation of characters.

Mr. Sutton ‖ showed garden forms of *Primula sinensis* in which all the individuals with markedly frilled edges to the leaves had also frilled edges to their petals. Some may say this is only one character duplicated in two parts of the plant. But all characters which cannot be dissociated are in truth one.

* * * *

The association of characters dependent upon sex was one of the subjects treated by Darwin, and upon which he threw a flood of light. He showed us how it is possible to account, in some cases, for the constant association of secondary with primary sexual characters. In other cases, although the necessity for this association is undoubted, the reason for it was not known to him. Now if sex determines the association of characters in unisexual organisms, it is possible that the function of reproduction in those organisms which possess alternative or auxiliary modes of reproduction may also determine the association of characters.

For instance, the Amaryllideæ generally possess three modes of reproduction: (1) by sexual union productive of seeds, (2) by a par-

* See (1) *Vegetable Teratology*, Dr. M. T. Masters, 1869. Ray Soc.; also (2) *Gard. Chron.*, 1886, p. 74; and (3) *Traité des Giroflées*, E. Chaté.

† Pearly or flesh-coloured in six genera; green in nine genera; yellow in two genera.

‡ Flat in eight genera; bulbous in four genera.

§ The association of Leucojum and Acis in one genus appears faulty.

‖ Royal Horticultural Society Scientific Committee.

thenogenic process of germination upon the placenta, and (3) by offsets or buds. Some species of Crinums are said to reproduce themselves occasionally by simple division of the rootstock,* and other genera produce *droppers*, axillary buds, or underground stems capable of rooting from cuttings at their nodes, &c. But I wish only to draw attention to the first three methods of reproduction. Now under the third section offsets or buds generally produce plants which are true to their parent—that is, in which all the parental characters are associated. I believe that this rule obtains in all cases of bud reproduction in good species, for in all good species all the characters are linked together, and it is this very association (by some innate necessity) which constitutes the species. But when we propagate mongrel plants by the same means we often find that the progeny is by no means true to the parent, because in the latter case we are dealing with plants in which all the characters are no longer linked together by necessity.†

Plants propagated by sexual self-union resulting in seed exhibit these traits in a more marked manner. The variability of some (mongrels) and the comparative constancy of others (species) is foreordained by the elemental character of the plant, and would be known beforehand if these elemental characters were known in their entirety. But when we consider the results of parthenogenesis I wish to draw special attention to certain observations, the importance of which seems to have escaped attention. Take it for granted that the beauty of flowering-plants and the splendour of their coloration has been attained during the period within which such plants have reproduced themselves by sexual methods; and I have noted many cases in which parthenogenic reproduction of highly bred plants has been associated with the production of ancestral types of perianth in the progeny, that the change in the means of reproduction to an asexual condition has been associated with a carrying back of the perianth to the condition of some remote ancestor. In other words, that these characters are associated.

On four separate occasions have I examined the progeny of an alleged hybrid between some garden Hippeastrum and *Vallota purpurea*. In every case the result was a Hippeastrum of sorts, but far less beautiful than the parent Hippeastrum. In three cases the result was for all practical purposes *Hippeastrum rutilum*, a species which I have always regarded as the oldest, and hence the most rudimentary, in the genus. Now, if in all these cases the attempted hybridization failed to result in cell-union, but exerted sufficient irritation to cause some form of parthenogenesis, then the association of character (ancestral type of perianth) with function (ancestral means of reproduction) would account for the depauperated offspring. It should not be thought that these depauperated plants were merely weaklings, and hence carried poor flowers, for such was not the case. In fact, the batch raised recently by Mr. James Hudson at Gunnersbury are exceptionally vigorous

* This is on the authority of the late Sir Charles Strickland.

† The garden Cineraria cannot be relied on to come true even from root divisions. I have known double pink individuals produce nothing but single bicoloured blue and white flowers from root divisions.

plants, but are many generations behind the present type of garden Hippeastrum in the beauty and form of the flowers. But we must not overlook evidence which tells in another direction, for it is alleged that these may be hybrids and not parthenogenic offspring. In favour of this assumption is the fact that Mr. Chapman raised typical *Hippeastrum rutilum* at Wylam-on-Tyne, and he declares that he used *Vallota* as the female parent and a garden Hippeastrum as the male. If no mistake occurred in his case it is quite clear that the *H. rutilum* he raised is a hybrid; and, if so, why not the *H. rutilum* raised by the reverse cross?

Personally, I have regarded these alleged *Hippeastrum* and *Vallota* crosses raised on *Hippeastrum* as parthenogenic offspring, and consider that these instances provide an interesting study of the association of characters. But there are other instances of like nature which have come under my notice among Amaryllids. Mr. John Hoog, of Haarlem, some years back crossed the two most beautiful Hymenocallids, *H. speciosa* and *H. amancaes*, together; but, as the offspring were "wretched things of no beauty or merit whatever," he destroyed the whole batch. This I consider to be another similar case of association brought about in consequence of parthenogenic reproduction.

We should therefore anticipate some retrogressive variation in parthenogenic generations in any optimum type of flowering plant, because this optimum stage has clearly been attained through successive generations of sexually perfect progenitors; but it by no means follows that typical or depauperated individuals will produce parthenogenic progeny showing regressive variation. I have experimented with several typical Habranthi and Zephyranthes and produced several generations of parthenogenic offspring similar in every respect to the parents. But in these cases I was dealing with species which habitually reproduce themselves from offsets with great facility and rapidity, and the character of the perianth was constantly associated with non-sexual methods of reproduction in these species.

THE GENUS POLIANTHES (INCLUDING PROCHNYANTHES AND BRAVOA).

By A. Worsley.

Authors who have treated these three genera as distinct from each other have merely copied these names from earlier writers, but without demonstrating that any sufficient distinctions exist to support the retention of three distinct genera. Of recent years hybridists have shown, in at least two cases, that members of these alleged genera can be crossed as easily as though they were species of but one genus.

In 1894 *Prochnyanthes Bulliana* (*Bot. Mag.* 7427) was crossed, in the Royal Gardens, Kew, with *Bravoa geminiflora*, which cross produced, in 1899, the hybrid named *Bravoa* × *kewensis* (*Gard. Chron.*, Aug. 1889, p. 112). This hybrid holds an intermediate position between the parent species in some of its characters, but in general it inclines towards the female parent in the ratio of 2 to 1. It is fertile to its own pollen.

In 1903, 1905, and 1906 Mr. Bliss, in his garden at Orpington, crossed *Bravoa geminiflora* with a garden form of *Polianthes tuberosa*, which cross produced, in 1907, the hybrid *Polianthes* × *Blissii* hereinafter described. This hybrid is also fertile to its own pollen.

The three genera have therefore all been crossed *inter se*, and have produced in addition fertile hybrids, which clearly shows that they should all be included in one genus, to which the old Linnean name of *Polianthes* must be given.*

Whenever foreign pollen has been used, it is well known that the paucity and infertility of the resulting seed is a true gauge of the remoteness or comparative irreconcilability of the parents. In such cases the pollen is not altogether suitable for fertilizing the ovules—some difficulty has to be overcome at the very start; and hence few ovules are fertilized, few seeds result, and much of what looks like seed proves infertile. On the other hand, when we find that the normal quantity of seed is produced, and that germination is good, we then know that the parents belong to the same genus. Now Mr. Bliss obtained conclusive results in 1906. On that occasion he pollinated five flowers of *B. geminiflora* with the pollen of *P. tuberosa*, and three fruits were produced, containing twenty-eight, twenty-one, and eighteen seeds respectively. Of these sixty-seven seeds no less than fifty-two grew up. This one fact is quite conclusive of the near relationship of the parents.

The hybrid *P.* × *Blissii* takes four months to ripen its seed. Its fruit is larger and its seed more shining than is the case with

* Rose and others have already transferred *B. geminiflora* with other species to *Polianthes* on morphological grounds.

B. geminiflora. But I have been unable to use these characters in my analysis because I have been unable to obtain a fruit of the pollen parent with which to compare them.

FIG. 179.—POLIANTHES × BLISSII.

Polianthes × Blissii.

Analysis of parental and hybrid characters.

There are ten characters in which the parents differ from each other—in respect to which ten characters the hybrid holds an intermediate position in six, resembles the female parent in none, and the male parent in four. The ratio is $2\frac{1}{3}$ to 1 in favour of the male, the ten characters being represented by the expression 7m + 3f. But I must note that this results from examining three hybrid individuals, and that the result of analysing all the seedlings of this generation would probably modify the figures to some extent. The general appearance of the plant as seen "in elevation" is also much more suggestive of the female than of the male; but, however desirable from a garden point of view, it is not possible to reduce the general appearance of a plant to a comparable character.

It should be noted that the bracts are very variable both in the parents and in the hybrid; that the colour character is of little importance in the hybrid, because albinism exists in the genus *Bravoa*. Yet I attach much importance to the fact that the remarkable fragrance of *P. tuberosa* is present, to a modified extent, in the hybrid.

Bravoa geminiflora (Female).	*Polianthes tuberosa* (garden form). (Male).
a. *Flowers* scentless.	A. Very fragrant.
b. *Perianth* depending throughout.	B. Sub-erect.
d. ,, $\frac{3}{4}$ to $1\frac{3}{8}$ inches long.	D. $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long.
e. ,, red.	E. White.
f. ,, external surface dull.	F. External surface waxy.
g. *Peduncle* slender, wiry.	G. Stout, woody.
h. *Style* exserted.	H. Shorter.
j. *Flowering stem* 1 to $1\frac{1}{2}$ feet long.	J. 2 to 3 feet long.
l. *Leaves* unspotted.	L. *Basal leaves* spotted below.
m. *Leaves* few (5 or 6).	M. More numerous (6 to 9).

Polianthes × *Blissii*
(the hybrid)
produced these characters in the three individuals examined:—

$\frac{A\,a}{2}\ \frac{B\,b}{2}\ \frac{D\,d}{2}\ \frac{E\,e}{2}$ F $\frac{G\,g}{2}$ H J L m in the first individual hybrid plant.

$\frac{A\,a}{2}\ \frac{B\,b}{2}$ d $\frac{E\,e}{2}$ F $\frac{G\,g}{2}$ H J L M ,, second ,, ,, ,,

$\frac{A\,a}{2}\ \frac{B\,b}{2}\ \frac{D\,d}{2}\ \frac{E\,e}{2}$ F $\frac{G\,g}{2}$ H J L $\frac{M\,m}{2}$,, third ,, ,, ,,

The last, quite accidentally, represents the mean of these three hybrids.

Polianthes is a deciduous genus. The year before flowering, a wide leafy growth is produced, but the year of flowering only a few straggling narrow basal leaves from the centre of which rises the bracteate flowering stem.

REPORT OF THE SOCIETY'S CONSULTING CHEMIST FOR 1910.

By Dr. J. A. Voelcker, M.A., F.I.C., F.L.S.

During the year 1910, fourteen samples were sent for analysis by Fellows of the Society, this being an increase on the six samples submitted in 1909. In addition, there were several inquiries with regard to the nature and use of gas lime, the quality of hay, and the use of insecticides.

The samples analysed were as follows:—

Ground lime	1
Waters	5
Soils	8
	14

Ground Lime.

The sample submitted gave the following analysis:—

	Per cent.
Lime	83·83
Oxide of iron and alumina	2·09
Silica	3·09
Water of hydration, &c.	10·99
	100·00

In addition to containing a good percentage of caustic lime, the sample was finely ground and quite satisfactory.

Waters.

Of the five samples of water analysed, three were of satisfactory character and do not call for special note. In the fourth case the water was of decidedly abnormal nature. The analysis was as follows:—

	Grains per gallon.
Total solid residue	208·04
Oxidizable organic matter	1·73
Nitric acid	None.
Chlorine	3·29
Equal to chloride of sodium	5·43
Free ammonia	·055
Albuminoid ammonia	·021
Hardness	132°

The total solids contained, in addition to much lime and magnesia salts, alkaline carbonates and sulphates, and the water also had a great deal of organic matter and ammonia, so that, apart from its extreme hardness and general unsuitability, it was an impure supply and quite unfitted for drinking purposes.

The remaining sample of water was one sent to me from Cornwall, and which was suspected of being saline in character. It was desired to know whether it would be sufficiently "salty" to be unfitted for horticultural purposes.

The water gave, on evaporation to dryness, a total solid residue amounting to 13 grains per gallon. Of this, no less than 9·52 grains per gallon consisted of common salt. While the proportion of salt to total solids is relatively very high, it could hardly be said that the water was sufficiently saline to make it unsuitable for employment for garden purposes.

Soils.

(a) *Soil for growing Apples.*—The sample sent me came from New Barnet, and it was desired to know whether it was suitable for the growing of apples. The analysis was as follows:—

	Soil dried at 212° F.
Organic matter and loss on heating	17·12
Oxide of iron	4·29
Alumina	10·79
Lime	1·83
Magnesia	1·73
Potash	·77
Soda	·47
Phosphoric acid	·26
Sulphuric acid	·22
Insoluble silicates and sand	62·52
	100·00
Nitrogen	·671

The above figures show that the soil was an extremely rich one, containing an abundance of vegetable matter, and being more than ordinarily well supplied in nitrogen. There was also an abundance of lime, and in both phosphoric acid and potash—these being essential points in fruit-growing—the soil was distinctly rich. The analysis accordingly showed no deficiency of desirable constituents, and being, as was the case, one of deep nature, it should answer the purposes very well.

(b) *Soil for Fruit Trees.*—This sample was sent me from Guildford, Surrey, and the analysis was as follows:—

	Soil dried at 212° F.
Organic matter and loss on heating	4·02
Oxide of iron and alumina	7·62
Lime	·56
Magnesia, alkalies, &c.	·28
Phosphoric acid	·35
Insoluble siliceous matter	87·17
	100·00

The soil was of somewhat too light and gritty a character to do really well for fruit trees. The analysis shows it to contain comparatively little vegetable matter, and the amount of lime was also decidedly

small. Such a soil would be benefited by the application, first, of lime, and, subsequently, of farmyard manure. In phosphoric acid it was well supplied.

(c) *Soil for Rhododendrons and Azaleas.*—A sample was sent me from Alford, Somersetshire, in order to know whether Rhododendrons and Azaleas would be likely to thrive on it. The analysis was as follows:—

	Soil dried at 212° F.
Organic matter and loss on heating	5·05
Oxide of iron and alumina	7·39
Lime	1·65
Magnesia, alkalies, &c.	2·06
Insoluble siliceous matter	83·85
	100·00

This soil, it will be noticed, does not contain much vegetable (organic) matter, and would be the better for a larger quantity. The amount of lime also is considerable, although, perhaps, not so much as to rénder the soil unfitted for growing Rhododendrons, &c.

The suggestion having been made that the soil possibly contained prejudicial saline matters, I determined the quantity present, but found that the soil yielded, altogether, only ·04 per cent. of matters soluble in water. The soil, however, could not by any means be called an ideal one for growing Rhododendrons, Azaleas, &c., for, in addition to the paucity of vegetable matter, it was of considerably heavier nature than is desirable for these plants. The best thing to do with such a soil would be to incorporate with it a liberal amount of vegetable matter and also sand, in order to lighten its character and, at the same time, reduce to some extent the lime contained.

(d) *Soil for a Lawn.*—A sample of soil from a lawn was sent me for examination. This gave the following analysis:—

	Soil dried at 212° F.
Organic matter and loss on heating	6·72
Oxide of iron	2·95
Alumina	5·44
Lime	·66
Magnesia	·63
Potash	·51
Soda	·42
Phosphoric acid	·10
Carbonic acid	·10
Sulphuric acid	·09
Insoluble siliceous matter	82·38
	100·00
Nitrogen	·294

The above analysis showed a distinct deficiency of phosphoric acid. The amount of lime also, while possibly sufficient for immediate purposes, might, with advantage, be increased. On such a soil as this, for use as a lawn, probably the best thing to apply would be fine bone meal. The supply of nitrogen should also be kept up, care, however,

eing exercised to apply it in an organic and slowly-acting form, such s stable manure, leaf-refuse, &c., and not by forcing nitrogenous nanures such as nitrate of soda, &c.

(e) *Soil for Herbaceous Plants and Roses.*—This soil came from ear Nantwich, and might be described as a black-coloured peaty sand. The analysis was as follows:—

	Soil dried at 212° F.
Organic matter and loss on heating	7·33
Oxide of iron and alumina	3·79
Lime	1·05
Magnesia, alkalies, &c.	1·87
Phosphoric acid	·67
Insoluble siliceous matter	85·29
	100·00

The above figures show that the soil was well supplied with egetable matter, and also that it was exceptionally rich in phosphoric cid. Of lime, there was only a moderate amount present, and, conidering the peaty character of the soil, the further use of lime would ppear desirable, except where such plants as heaths, rhododendrons, zaleas, &c., are intended to be grown.

The question was also asked whether the soil would be well adapted o roses. It appeared to me that the sandy nature and the comparaively small amount of clay would rather militate against the atisfactory growth of roses, and that, if it were desired to effect this, heavier soil or clay should be incorporated with it.

(f) *Oolite soil for Garden purposes.*—A Fellow of the Society, whose land was situated on the oolite formation, sent me for examinaion a sample of soil to know whether it would be of any use incorporating this with his own (oolite) soil with the object of growing on it plants that did not do well with lime. The analysis of this soil was as follows:—

	Soil dried at 212° F.
Organic matter and loss on heating	68·88
Oxide of iron and alumina	4·56
Lime	3·33
Magnesia, alkalies, &c.	1·80
Phosphoric acid	·79
Insoluble siliceous matter	20·64
	100·00

This was a very peaty soil, containing much root fibre, and, as will be seen by the analysis, was very rich in vegetable matter.

There was very little clay, and the soil was practically decomposed vegetable matter. Further, it was very rich in phosphoric acid.

The lime amounted to rather over 3 per cent., which, in view of the peaty character of the soil, could not be considered at all prejudicial as regards the growing of plants which do not like lime. It would also be a suitable one to mix with soils poor in vegetable matter, and would also help largely in reducing the excess of lime contained in soils of the oolite formation.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

IX.—Calcium Cyanamide and Nitrate of Lime.

By F. J. Chittenden, F.L.S.

Considerable progress has been made in bringing free nitrogen in combination in forms suitable for use as manures costing no more th already existing ones, since Sir William Crookes in his memorab address on "The Wheat Supply of the World" at the British Ass ciation in 1898, pointed out that the world's supply of combined nitrog was rapidly approaching exhaustion.

Sir William Crookes then looked to the direct combination of t two gases, nitrogen and oxygen, as the solution of the difficulty, and showed, as Priestley had shown long before, that under the influen of high temperature they would combine together. With the cheape ing of electrical current through the utilization of power heretofo running to waste in waterfalls this direct combination has been render possible on a commercial scale, and while technical difficulties soo brought the manufacture of nitric acid at Niagara to a conclusion, t Berkeland-Eyde process in use at Notodden has been at work son time. The nitric acid made there is caused to combine with lime, a the nitrate of lime is crystallized out of the solution obtained.

Before this method of combining nitrogen and oxygen on a co mercial scale had been successfully worked out, another nitrogenou manure called nitrolim or calcium cyanamide had been put upon t market. This, like nitrate of lime, depended upon cheap electric power for its manufacture at a price that would compare favourab with that of ammonium sulphate, since calcium carbide is used making it. It was first made on a large scale by an Italian firm Piano d'Orta, in Central Italy, but since 1905 several factories ha sprung up in various parts of the world, including the great works the North-Western Cyanamide Company at Odda, at the head of Ha danjer Fjord, in Norway. This company supplied the calcium cya amide used in the trials detailed below.

The processes of manufacture of these two fertilizers need not further alluded to. They have been described in many recent public tions,* but the fact that both contain lime in combination with nitrog may be emphasized.

It is probable that in some districts at least the growth of mot traction will cause a marked decrease in the quantities of stable manu available. Stable manure has been the main source of nitrogen f

* E.g. *Fertilisers and Manures*, by A. D. Hall, F.R.S.; *Principles an Practice of Agricultural Analysis*, vol. ii. (Ed. 2), by H. W. Wiley; *Trans. the Faraday Society*, vol. iv. pt. 2, October 1908; etc.

garden crops up to the present, but if the supply diminishes largely other sources will have to be tapped. The large number of other organic substances commonly used for manure are mostly waste products, and their supply cannot be expected to respond to a growing demand. Greater attention will necessarily be paid to the use of chemical manures, and green manuring for the supply of nitrogen.

Until the introduction of the two manures in question practically the only available chemical manures containing nitrogen were nitrate of soda and sulphate of ammonia. The supply of the latter depends largely upon other manufactures, and is not directly connected in any way with plant-industry, though special sources may be developed before long. Estimates have been made leading to the conclusion that the nitrate deposits in South America (and no other deposits of large extent are likely to become available) are within measurable distance of extinction. Whether these estimates are based on accurate information or not, agriculturists and horticulturists alike will welcome the advent of two new manures, like nitrate of lime and calcium cyanamide, comparable in their effects upon plants with nitrate of soda and sulphate of ammonia respectively.

It may not be out of place to allude to the fact that the value of substances added to the soil as manures depends not only on the essential chemical elements they supply the plants, but also upon the influence they have upon the "reaction" of the soil and upon its physical condition. It is well known, for instance, what a remarkable effect farmyard and similar organic manures have upon the physical condition of a soil, and what an important part lime plays (though we fear this is often lost sight of) in the maintenance of good physical conditions and the prevention of soil acidity. It is not likely therefore that bulky manures can be completely replaced by chemical fertilizers, but the latter wisely used in combination with the former will economize both and lead to the production of better and healthier crops.

That other sources of combined nitrogen may be made available as time goes on is not at all improbable. The bacterial fixation of nitrogen is continually utilized in practical farming by the cultivation of leguminous crops and the use of their residues as manure, while no doubt some form of "green-manuring" will be made to take the place of the heavy dressings of farmyard manure now in vogue. The interesting paper by Mr. W. D. Scott-Moncrieff in this Journal (vol. xxxiv. pp. 462-468) opens up a method of preventing enormous economic loss by making use of the nitrifying power of bacteria upon sewage matter.

The trials detailed below were carried out to ascertain how calcium cyanamide and nitrate of lime compared in their effects upon growth and development with sulphate of ammonia and nitrate of soda.

The site of the trials was varied in each of the three years covered by the experiment, so that no accumulated effects interfered with the results. The land used in 1908 was poor land in fair condition of tilth; in 1909 it was poor and not in good condition, and the plants

consequently suffered through interference with the water supply; i 1910 a piece of land in good condition, manured with farmyard manur some years previously, was used. The area covered by the whole o the six plots in each year had been treated alike ever since the lan has been in the Society's possession.

The plots were, in any year, all of the same size and shape, an were separated from one another by paths 1 foot wide. The land wa dressed before digging with superphosphate and kainit.

Nitrate of soda was used at the rate of 4 cwt. to the acre, and th other manures were used in such quantities that each plot received th same weight of nitrogen.

Equal quantities of seed were sown on the plots, turnip bein chosen as being most likely to show results easy to estimate. Th seed was equally apportioned between the rows, and, when larg enough, the plants were thinned to equal distances apart in the rows In 1908 the seed was sown on June 20, and the crop harveste November 2; in 1909 it was sown on July 23, and harveste November 10; in 1910 it was sown on May 2, and harvested July 28 The crop, freed from soil, was weighed as it was lifted, the tops and roots being weighed separately.

Table I. shows the yield in each of the three years from each of th different plots. It will be seen that the plots varied somewhat fro year to year.

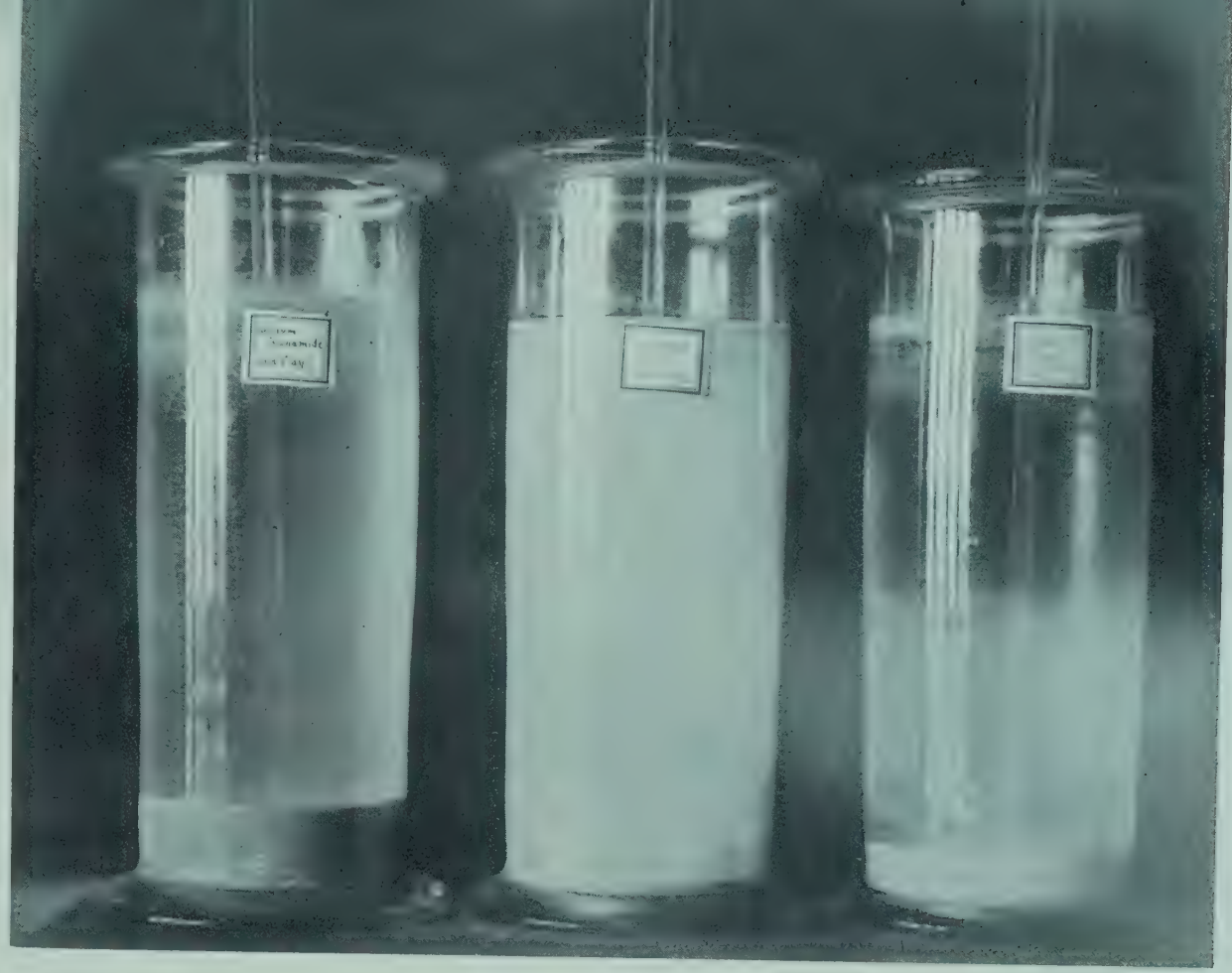
TABLE I.

YIELD OF TURNIPS FROM VARIOUSLY MANURED PLOTS.

Manure applied	1908			1909			1910		
	Roots	Tops	Total	Roots	Tops	Total	Roots	Tops	Total
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Nothing. . .	91	38	129	25	14½	39½	82½	77	159½
Nothing. . .	—	—	—	—	—	—	75	81¾	156¾
Calcium cyanamide	123	50	173	26½	19½	46	91½	95½	187
Hydrated calcium cyanamide . .	—	—	—	25	14½	39½	86	83½	169½
Ammonium sulphate	102	50	152	41	24	65	96	98¼	194¼
Nitrate of lime .	—	—	—	34½	21	55½	—	—	—
Nitrate of soda .	99	54	153	35½	20½	56	92½	122	214½

It is evident that with the exception of the hydrated calcium cyanamide each of the manures considerably increased the yield, and it will also be seen that the best comparative total yield was given by a different manure each year: in 1908 by calcium cyanamide, in 1909 by ammonium sulphate, and in 1910 by nitrate of soda. This may possibly be due to differences in weather conditions, for the availability of ammonium sulphate and calcium cyanamide depend to a considerable extent upon chemical changes brought about by bacterial activity, and this is dependent *inter alia* upon moisture and temperature conditions in the soil.

If we attempt to eliminate the weather influence by adding the crops for the three years (which we may do considering the conditions



A B C

FIG. 180.

Fine pure clay was mixed with distilled water in glass vessels. To A a small quantity of calcium cyanamide was added, to C a small quantity of lime. After standing twenty-four hours the clay had settled in A and C, but showed no sign of settlement in B.

FIG. 181.– POTATO LEAF SHOWING LEAF BLOTCH.

of the experiment) we find, as the following table shows, that there is comparatively little difference in the final results obtained from the use of the three manures, nitrate of soda, sulphate of ammonia, and calcium cyanamide respectively.

TABLE II.

YIELD IN THREE YEARS FROM PLOTS MANURED WITH NITRATE OF SODA, AMMONIUM SULPHATE, AND CALCIUM CYANAMIDE.

Manure applied	1908	1909	1910	Total for three years		
				Roots	Leaves	Total
	lb.	lb.	lb.	lb.	lb.	lb.
Nothing	129	39½	159½	198½	129½	328
Nitrate of soda . . .	153	56	214½	227	196½	423½
Ammonium sulphate .	152	65	194¼	239	172¼	411¼
Calcium cyanamide . .	173	46	187	241	165	406

It would appear, therefore, that for supplying nitrogen over the whole growing period of the crop there is little to choose between these three. The question of the rapidity of their action is referred to later.

So far as can be judged from a single experiment the effects of nitrate of lime are about equal to those of nitrate of soda, but for reasons given below its use was discontinued.

The following table is instructive. It represents the growth made by the turnips in their early stages and indicates the ease with which the plants could make use of the various manures applied before sufficient time had elapsed for any great changes had taken place in them.

TABLE III.

WEIGHT OF THINNINGS.

Plot	Manure applied	Weight of thinnings			
		Row 1	Row 2	Row 3	Total
		Grammes	Grammes	Grammes	Grammes
1	Calcium cyanamide . .	1,910	2,247	1,785	5,942
2	Hydrated calcium cyanamide	1,210	1,510	1,340	4,060
3	No manure	2,720	3,044	1,570	7,334
4	Ammonium sulphate . .	2,442	2,687	2,077	7,206
5	Nitrate of lime . . .	5,775	5,390	5,507	16,672
6	Nitrate of soda . . .	6,807	7,702	7,127	21,636

As was pointed out above, the quantities of manures applied were such as to add equal quantities of nitrogen to each plot except No. 3; the same quantity of seed was sown in each row on July 23, 1909, and the plants were thinned to equal distances apart and the thinnings, shaken free of earth, weighed on August 28, 1909. It will be seen that the two nitrates stimulated growth much more than any of the other manures. At that date the ammonium sulphate had had no effect. The calcium cyanamide seems to have had a retarding influence, the effect in this direction of the hydrated calcium cyanamide having been greater than that of the calcium cyanamide.

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It would thus appear that, at least on our soil, the nitrogen in hydrated calcium cyanamide is less readily available than that in calcium cyanamide, and this is confirmed by the following results:—

TABLE IV.

FINAL YIELD FROM CALCIUM CYANAMIDE, HYDRATED CALCIUM CYANAMIDE, AND NO MANURE PLOTS.

	1909		1910	
	Roots	Tops	Roots	Tops
	lb.	lb.	lb.	lb.
Calcium cyanamide . . .	26½	19½	91½	95½
Hydrated calcium cyanamide . .	25	14½	86	83½
No manure	25	14½	82½	77

Here it is seen that during the period covered by the growth of the crop the nitrogen in the hydrated calcium cyanamide had little effect, but in some experiments in plots with these manures where several successive crops were removed, the final result was that the last crops from the soil manured with hydrated calcium cyanamide were far better than those from plots manured with other chemical nitrogenous fertilizers containing equivalent quantities of nitrogen, thus indicating that its effects are more lasting, and that the nitrogen contained becomes slowly available.

The results shown at Table V. also indicate, though not in a very marked manner, that the nitrogen in calcium cyanamide itself is less readily available than that in nitrate of soda. The seed was sown June 20, 1908, on unmanured land, and on August 17 a full dressing of calcium cyanamide was given to one plot, a half-dressing of nitrate of soda to the second, the third remaining unmanured. On November 2, when the crop was weighed, the results were as follows:—

TABLE V.

YIELD FROM LATE DRESSINGS OF CALCIUM CYANAMIDE, NITRATE OF SODA, AND NO MANURE.

Manure applied	Weight of roots	Weight of tops	Total
	lb.	lb.	lb.
Calcium cyanamide . . .	85	48	135
Nitrate of soda (half dressing) .	92	46	138
No manure	91	38	129

The results indicate that if a nitrogenous manure is required to exert its influence immediately, nitrate of soda or nitrate of lime are the ones to use; if less active but more lasting manures are desired, ammonium sulphate and calcium cyanamide are of about equal value, nitrogen for nitrogen.

Nitrate of Lime.—The commercial nitrate of lime is a pale brownish compound, free from smell, and at first finely granular. It contains about 75 per cent. to 77 per cent. of calcium nitrate, $Ca(NO_3)_2$, the residue being water with a very small amount of other substances. It is not only very soluble in water, like other nitrates, but is also

extremely hygroscopic. The following table shows how very readily it absorbs water from the air when exposed in a saturated atmosphere as compared with calcium cyanamide and nitrate of soda.

[To arrive at these figures small quantities of the substances were accurately weighed out into small open dishes standing over water under bell glasses. They were thus under the best condition for absorbing water. The dishes and their contents were re-weighed at the end of forty-eight hours, and again later. The results given are the average of several weighings.]

TABLE VI.

ABSORPTION OF WATER FROM SATURATED AIR.

	Original weight	Weight at end of forty-eight hours	Weight at end of one hundred and twenty hours
Calcium cyanamide	100	102·7	158·7
Nitrate of soda	100	105·8	226·9
Nitrate of lime	100	115·6	247·2

The nitrate of lime thus takes up water very readily indeed from the air, and we found this property made it very difficult to sow, since it quickly caked and became sticky, while, when stored under conditions that caused no perceptible change in nitrate of soda, the bulk took up sufficient water to cause it to cake, and, later, some was lost by solution in water absorbed from the air. It was for this reason that it was used in one season only. No doubt if it were used immediately the barrel was opened, the latter having been kept in a dry place until used, it might be applied readily enough; but in gardens it is seldom necessary to use a barrel at a time.*

The average percentage of nitrogen in commercial nitrate of lime is 13, and, as we have pointed out above, it supplies nitrogen in a readily available form, and is, nitrogen for nitrogen, of equal value with nitrate of soda.

As nitrate of soda contains on an average 15·7 per cent. of nitrogen, the price of nitrogen of lime per cwt. should be less than that of nitrate of soda in proportion to the amount of nitrogen contained.

If superphosphate is mixed with nitrate of lime it should be sown immediately, otherwise undesirable reactions will be set up.

Calcium Cyanamide or Nitrolim.—This substance is in the form of a very fine dry black powder, consisting of about 57 per cent. of the pure calcium cyanamide, 14 per cent. of free carbon, and 21 per cent. of caustic lime. Small quantities of sulphur, phosphorus, silicon, &c., are also present. The nitrogen in the manure may be as high as 20 per cent., but the samples used in the foregoing experiment contained a little over 17 per cent.

As shown in Table VI., the cyanamide takes up water slowly, but not to such an extent under ordinary conditions of storage as to interfere in any way with its use.

* We are informed that good results and greater ease in use have been obtained by mixing the nitrate of lime with ashes before sowing it.

When cyanamide is exposed to moist air or acted upon by water in the soil it is converted into calcium carbonate, and ammonia; but this change appears to go on quite slowly under ordinary conditions, and in our soil it is evident that the nitrogen is only rendered available comparatively slowly. LÖHNIS has shown that bacteria are concerned in the process of converting the nitrogen into a form available for plants, and it would appear that the changes that take place are by no means simple. As we have seen above, the manure is comparable in its action to ammonium sulphate, and, nitrogen for nitrogen, its value is about the same. As it is not immediately available, it should be added to the soil some three or four weeks before it is desired that its effects should be seen; and in some cases, as is pointed out below, it is advisable to add the manure to the soil three weeks before seed-sowing.

The main difficulty in dealing with nitrolim lies in the fact that it is so fine that the process of sowing is rather disagreeable, for it tends to hang in the air. It has been submitted to a process for remedying this, and this "hydrated calcium cyanamide" is certainly more easy to deal with in this direction, but for some reason or other it proved far less readily available in our soil.

HALL* has shown that though under ordinary circumstances cyanamide may take water to some extent from the air, yet the loss of nitrogen due to this cause is imperceptible (amounting indeed to only 0.37 per cent., even when the nitrolim had gained 67 per cent. in weight by absorbing water from saturated air). It is thus practically as easy to store as sulphate of ammonia, and the probability of loss is much less than from nitrate of soda and nitrate of lime.

It is also shown in the same paper † that superphosphate may be mixed with the cyanamide without loss of nitrogen, for any ammonia set free is at once fixed by the superphosphate.‡ The mixture thus produced is much easier to sow—in fact, as easy as any other artificial manure.

We have not noticed any harmful effects on seed germination either in the garden or in pots following the use of calcium cyanamide, but owing to the possible formation, in some soils, of an alleged poisonous dicyanodiamide, it is best to apply the manure about three weeks before planting or seed-sowing.

The continued use of sulphate of ammonia tends to render the soil acid and infertile, but the cyanamide contains caustic lime, and is therefore more suitable for use on soil poor in lime than is sulphate of ammonia.

The continued use of nitrate of soda also has a harmful effect upon clay soil, deflocculating the clay and making it very sticky. This appears to be due to the fact that plants leave behind the soda of the compound in the soil, where it combines with carbonic acid forming the

* *Journal of the Board of Agriculture*, xiv. (1908), p. 652.

† p. 657.

‡ The temperature rises considerably as the mixture is being made and steam may begin to rise, but a little water added to the heap will keep the temperature from rising so high as to render loss probable.

alkaline carbonate. This substance has the power of deflocculating clay, and when present will prevent the action of lime upon it. Its evil influence can only be counteracted by the addition of an acid or acid manure like superphosphate of lime.

Figure 180 shows the action of small quantities of lime (lime water and calcium cyanamide) in flocculating clay. The clay falls rapidly owing to its particles becoming joined into groups, while in the distilled water they remain separate and in suspension. This action of lime on clay, as is well known, takes place in the soil, and so renders clay soils more open and workable, and calcium cyanamide has a similar action.

ON POTATO "LEAF BLOTCH" AND "LEAF CURL."

By A. S. Horne, B.Sc., F.G.S.

During a recent visit to Scotland I found three distinct cases of a leaf blotch disease, of which one, fortunately under control, proved exceptionally severe. In each case the potatos originally used for planting were imported from the Continent, and belonged to the variety known as 'President.'

In the first case the grower obtained seed potatos from Holland in 1909. In the crop resulting from this material he noticed a number of stunted plants with yellowish foliage and blotched leaves. When the crop was lifted, he found that the tubers borne by diseased plants were few in number, exceedingly small, and generally below the average size of potatos used for planting. It occurred to him, therefore, to save only the larger tubers, selecting by this means a large proportion of tubers produced by apparently healthy plants. These potatos were planted on the same farm in 1910. I saw the plants obtained from them in September and noticed a large proportion of diseased ones. The grower stated that the disease was quite as bad as it was in 1910, or even worse. The proportion of bad plants in the crop had not decreased, although, in all probability, most of the tubers borne by plants with diseased foliage in 1909 had been rejected. There was no sign of this disease among plants of other varieties grown in the same field.

The second case, to which my attention was drawn by Dr. W. G. Smith and Mr. W. Bruce, of the East of Scotland College of Agriculture, is of exceptional interest. It occurred on a potato field in the Edinburgh district. Amongst other varieties of potato grown in this field were two lots of the 'President,' situated in adjacent plots. These, when the farm was visited about the middle of September, were especially noticeable. All the plants of one lot were exceptionally strong and healthy and, from the appearance of the tubers, gave promise of a good crop, whilst those of the other lot were without exception unhealthy, and produced tubers of very small size. Upon inquiry it was found that one lot of 'Presidents' had been grown from seed potatos saved from a crop raised in Forfarshire and the other lot from a crop raised in Midlothian. The seed potatos from which the crops in Forfarshire and Midlothian were grown originally came from Holland. One lot was purchased in 1908, and it is believed that the other lot was obtained in 1909; but there is some doubt as to whether this really was the case or whether both lots were purchased in 1908. It appears that only small tubers were used for planting in the case of the bad 'Presidents.' These were, in all probability,

borne by plants with diseased foliage in 1909. Several varieties of potato were growing in the neighbourhood of the diseased 'Presidents,' but these, without exception, did not take the disease.

In the third case, a very large field in the neighbourhood of Dunbar had been planted with seed obtained from the Continent in 1910. I noticed stunted plants with the characteristic blotched appearance of the foliage scattered about here and there among the healthy ones. Some of the diseased plants were dug up, and it was found in every instance that the tubers borne by them were few in number and of negligible size. Nevertheless, the yield from the field in question was exceptionally heavy. This may be accounted for by the fact that the diseased plants were comparatively few in number, and the feeble development of a plant here and there may have corresponded to a kind of "weeding out" which proved on the whole advantageous to the development of the crop. The disease did not appear on other varieties of potato grown in the same and neighbouring fields. The important points to be remembered are:—

1. The disease appeared in the crop raised from seed potatos of the 'President' variety purchased from the Continent on at least three separate occasions (1908, 1909, 1910).

2. The disease appeared in 1910, among potatos originating from those imported in previous years.

3. When tubers of large size (from healthy plants) were saved for planting, the proportion of diseased plants obtained in 1910 was even greater than it was in 1909; when tubers of small size (from unhealthy plants) were used, practically no crop was obtained in the following year.

4. Two lots of 'Presidents' were grown side by side under similar conditions; of these, the one was entirely diseased and the other quite free from disease.

5. The yield from a field of 'Presidents' grown in one of the finest potato-growing districts of Britain was exceptionally large, although diseased plants which bore tubers of negligible size were scattered among the healthy ones.

6. The disease did not appear among a large number of other varieties of potato grown on the same field or farm.

It is difficult to avoid coming to the conclusion that leaf-blotch disease has reached Scotland on at least three separate occasions from the Continent with the 'President' variety of potato, and that there is a marked tendency for the disease to spread in Britain. The fact that, in spite of the presence of diseased plants, large crops of the 'President' have been obtained in some instances may not prove a fortunate circumstance, and it is possible that several additional cases may be reported in 1911.

It is of course impossible to describe the early symptoms of the disease, since the plants were not seen until towards the end of September and had already formed seed. At this time the unhealthy

plants, which were stunted and presented a yellowish appearance, could be distinguished from the healthy ones at a glance. The leaves, which were sometimes half-folded or curled, were marked, sometimes quite thickly, with dark brown patches, much smaller and darker than those caused by *Phytophthora infestans*.

In many instances, when examined closely, the blotches possessed a dark brown centre, sometimes only a spot, surrounded by a margin of a lighter shade. This is shown in the illustration, which is a drawing from a preserved and flattened specimen obtained in September (fig. 181). Sections were made across the blotched areas of leaves collected in September, and it was found that the epidermal cells of both the upper and lower surfaces were diseased and discoloured. The guard cells of the stomata were, on the whole, badly affected. The disease frequently extended inwards from the epidermal cells to the palisade tissue and mesophyll, and sometimes reached the vascular bundles, but there was no evidence to show, from the specimens examined, that it proceeded and spread from the bundles to the mesophyll and superficial cells. The condition of the conducting tissues of the petioles of diseased leaves was not such as to lead one to suppose that the disease had passed from the stem into the petiole and thence into the leaflets by means of the bundles. Several kinds of fungus-spore were observed upon the surfaces of leaves collected late in the season, amongst which were those of the form known as *Macrosporium*.

It is not advisable to draw conclusions with respect to the effect produced upon the plant owing to the condition of the guard cells; nor is it safe to speculate as to the nature and habit of the organisms * present from a study of the late stages of the disease only. It is hoped to deal with this subject when the matter has been more fully investigated.

Vañha,† in 1904, described a potato disease—Potato-leaf Blotch—which he supposed to be due to the fungus *Sporidesmium solani varians* Vañha. The foliage of plants affected with this disease is disfigured owing to the occurrence of small, scattered, brown spots on the leaves. These spots increase in size and fuse together, forming well-defined blackish-brown patches. Several forms of spore, including *Macrosporium*, are said to be produced during the life-cycle of *Sporidesmium*. Massee‡ states that this disease has only quite recently been observed in Britain.

Massee attributes a form of potato-leaf curl to *Macrosporium solani* Cooke. He states that the leaves curl, and that the stem droops before there is any external evidence (blackish-olive patches) of the cause of injury, and that as soon as the leaves begin to curl a microscopic section of the stem shows a dense mass of mycelium which plugs the water-conducting parts. "At a later stage, however, the

* The reproductive bodies of an animal organism were found in the diseased tissue of the particular specimens examined.

† Vañha. *Mitteil. Landesl.-Versuchst. für Pflanzenkr.*, Brunn II. (1904).

‡ G. Massee, *Diseases of Cultivated Plants and Trees*, p. 499.

FIG. 182.—POTATO LEAF SHOWING LEAF CURL.

(*To face page* 621.)

stem and leaves bear numerous blackish-olive, minutely velvety patches of various forms and sizes." He further states that when a potato plant is badly infected the mycelium of the fungus passes from the haulm into the underground branches and young tubers.

According to Massee, therefore, and in the particular case described by him, a parasitic fungus is present *in the tissues* of the tuber used for planting; as the plant develops the fungus passes by means of the conducting tissue from the "set" into the young haulm and eventually reaches the leaves. Whilst this is going on the mycelium passes from the haulm into the underground branches and young tubers.

With regard to the 'President,' a sequence of events similar to that described by Massee has not yet been observed. In the instances examined, the disease did not pass *by means of the conducting tissue* from the "set" into the haulm and leaves, nor did it pass from the haulm into the young tubers. The disease, on the other hand, worked its way from the surface of the leaves into the more deeply seated tissue. It seems very likely that the fungus or fungi associated with this disease exist on the skin of the potato, and partly owing to the elongation of growing organs, are carried, *externally*, during growth, to the various parts of the plant.

In 1906, L. R. Jones and C. S. Pomeroy* described a leaf blotch disease of potato, prevalent in some parts of the United States. This disease is said to be due to the fungus *Cercospora concors*.

From the published accounts it would appear that a blotched condition of the potato leaf may be brought about by more than one fungus, and perhaps by different combinations of fungi.

. The leaves of the potato may be folded, crinkled, rolled or curled in various ways, when they are not otherwise disfigured. This has been recorded recently by Massee† (1910), O. Appel‡ (1908), Schleh§ (1909), and Steglich‖ (1909), in Germany; Ducloux and Hédiard¶ (1909), in France, and numerous other investigators.

During the course of some experimental work in the North of England, in connexion with a local epidemic of *Phytophthora infestans*, de Bary, carried out in 1909, a number of plants with rolled or curled leaves were noticed in a twenty-acre field owned by George Pollard, Esq., of Cleadon Grange in the County of Durham. Accordingly, over one hundred plants were specially marked so that they could be recognized at the time of lifting the crop. These were dug up separately, and it was found that they were almost invariably affected with Blackleg, which is the British equivalent of a disease described by Erwin Smith** (1896) as "A bacterial disease of the tomato, egg plant and Irish potato," and of that described by Grotenfeld†† (1901),

* L. R. Jones and C. S. Pomeroy. *Vermont Sta. Report* (1906), pp. 236-57.
† Massee. *L.c.* p. 501.
‡ O. Appel. *Jahresber. ver. Angew. Bot.*, 6 (1908), pp. 259-65.
§ Schleh. *Fuhling's Landw. Ztg.* 58 (1909), No. 18, pp. 641-63.
‖ Steglich. *Sächs Landw. Ztschr.* 57 (1907), No. 17, pp. 296-98.
¶ Ducloux and Hédiard. *Betterave*, 19 (1909), No. 487, pp. 299-300.
** Erwin Smith. *U.S.A. Dep. Agr., Bull.* 12 (1896).
†† Grotenfeld. *Hufondstadsbladets Landtbruksbilagen* (1901), No. 5.

O. Appel* (1903), and others as Schwarzbeinigkeit. The association of "Leaf curl" with a bacterial disease of the potato has been recently investigated by Steglich† (1909).

In Blackleg the haulm of the young plant becomes blackened just above the level of the soil. The discoloration spreads, and ultimately the lower portion of the stem rots and falls to the ground. During the progress of this disease in the haulm the foliage goes through a sequence of changes—first the foliage becomes yellowish and the leaflets become more or less rolled or curled, then the leaves droop and wither, and finally, sooner or later, depending on the condition of the haulm, the foliage falls and rots. The black rot extends in both directions from the haulm, by means of the vascular bundles, upwards into the stem and downwards into the young tubers. The disease appears in the tuber as a dark ring at first—observed by Erwin Smith in 1896—owing to its being confined to the vascular bundles. This phase of Blackleg has been called "Ring disease" (Ringkrankheit). The affected tubers ultimately rot. In every case the unhealthy plants produced very few tubers of small size. The disease appeared to the greatest extent among plants grown from seed raised on the farm in the previous year.

The markings in the tuber due to Blackleg differ entirely from those characteristic of Internal disease and Streak-disease.‡ In "Ring disease" the markings in the tuber follow the course of the vascular bundles; in the other forms of disease the markings *do not*, as a rule, follow the course of the vascular bundles. Again, "Leaf curl" is not a characteristic symptom of Internal disease and Streak-disease, but there is no reason why plants thus affected should not sometimes bear rolled or curled leaves.

The symptoms of Blackleg in the Cleadon district may be summarized as follows:—

- Blackleg = Schwarzbeinigkeit = Black Stalk-rot (G. H. Pethybridge§)
  - Symptoms not confined to Blackleg
    - "Leaf roll" or "Leaf curl" (Blattrollkrankheit)
      - Leaves more or less rolled or curled—ultimately droop and wither.
  - Symptoms more or less constant
    - Blackleg
      - Local rot of haulm, rot spreads and foliage collapses.
    - "Ring disease" (Ringkrankheit) and black rot
      - Ring of blackish spots in tuber.
      - Partial or complete rot of tuber.

* Appel. *Ber. d. Deutsch. bot. Ges.*, Bd. xx. p. 128 (1902).
† Steglich. *L.c. ante.*
‡ A. S. Horne. *Jour. Agr. Sci.*, III. pt. 3 (1910), pp. 322-32.
§ G. H. Pethybridge. *Jour. Dep. Agr., Ireland*, x. No. 2 (1910): G. H. Pethybridge and P. A. Murphy. *Proc. Roy. Irish Acad.* xxix. B. No. 1 (1911).

Massee states that Blackleg is at present rare in Britain, but that it is very destructive in its effects.

A rolling or curling of the leaf, indistinguishable from that associated with Blackleg in the Cleadon district, is frequently exhibited by plants possessing no other visible symptoms of disease. For example, in 1910 I observed a number of young plants among those in my experimental plots at Newcastle-upon-Tyne, with leaves badly rolled or curled (fig. 182) and sometimes wrinkled. Several plants were dug up, and in most cases the subterranean stem had been cut by the hoe or presented an unhealthy appearance. There were, however, no cases of Blackleg. In other examples, there seemed no injury of any kind sufficient to account for the condition of the foliage.

The phenomena of the rolling or curling of the leaves of the potato plant may occur, therefore, under the following circumstances:—

Leaves rolled, curled or partly folded { associated with no visible symptom of disease. ,, with accidental injuries to the haulm. ,, with a brownish discoloration of the subterranean stem. ,, with Blackleg. ,, with a spotted or blotched condition of the leaf.

P. de Caluwe* (1908), in Holland, and Remy and Schneider† (1909), in Germany, give accounts of the prevalence of "Leaf curl" in their respective countries, where it appears to have become destructive to crops. If the state of affairs on the Continent be as bad as it appears from published accounts, and if forms of disease which come under the category of "Leaf curl" and "Leaf blotch" be imported from the Continent, there is every reason to suppose that, sooner or later, "Leaf curl" and "Leaf blotch," will be prevalent and destructive in Great Britain also.

I desire to acknowledge my indebtedness to the Royal Society for a Government grant in aid of the investigation of the more obscure diseases of potato.

* P. de Caluwe. *Handel. Vlaamsch. Natuur en Geneesk. Cong.* 12 (1908), No. 2, pp. 195-200.

† Remy and Schneider. *Fuhling's Londw Ztg.*, 58 (1909), No. 6, pp. 201-19.

THE ROYAL HORTICULTURAL SOCIETY.

[The following appreciation of the Society's work by an anonymous correspondent appeared in the *Times* for Saturday, February 11, 1911. The Editor of the *Times* has courteously permitted us to reproduce it.]

All the gardeners of England are indebted to the Royal Horticultural Society, whether they are Fellows of it or whether they are not. It is at the present time one of the most prosperous and beneficent societies in existence. It may be worth while therefore to relate a few facts about its past history and its present condition and activities, and we shall relate them, not only for their own sake, but also in the hope that they may induce any readers who are not yet Fellows of the Society to become Fellows; for it can only maintain its present prosperity and usefulness if it has the support of those who ought to support it—that is to say, of all gardeners in the country.

It may be a surprise to many of the present members to hear that its prosperity, though not its usefulness, is recent. In 1887 the income of the Society was £2,894, and its expenditure £3,577. There was also a debt of £1,152. The total number of Fellows was 1,329, of whom 556 were life Fellows. They had paid their subscriptions in a lump sum, and this sum was lost. There remained, therefore, only 773 subscribing Fellows. Thus the Society had reached a crisis in its affairs. Either its policy was wrong or it was not wanted. Some members of the Council despaired, and there was a proposal to make an end of it. But others thought that only a change of policy was needed, and they prevailed. The first result of the change of policy was the resignation of 221 subscribing Fellows, so that in 1888 the Society began its new career with only 552 subscribing Fellows, a debt of over £1,100, and an expenditure much in excess of its very precarious income. The expenditure for 1910 was £17,488 and the income £25,858. The number of Fellows had risen to 12,043, and the debt had changed to investments of the value of £51,321. Besides this the Society now owns a hall which, with its furniture, is worth £42,000, and the gardens at Wisley with their laboratory and dwelling-houses and green-houses. In 1910 alone there was an increase of over a thousand in the number of Fellows and of £2,661 in the income. This, we believe, is the largest annual increase the Society has ever known.

Many Fellows have by their disinterested efforts contributed to this wonderful success, and they have been encouraged to give their help by the manner in which the Society is directed. It is a Society which exists for the good of all gardeners and not for the profit or advertisement of any individual. Those who have done most for it have always

said least about their services. They have had only one aim—namely, that theSociety should always increase in prosperity and usefulness. They neither need nor desire any advertisement, but it would be mere ingratitude not to mention some of their names. Sir Trevor Lawrence has been President of the Society ever since 1885. He was therefore President when the crisis came, and his loyalty to the Society was unshaken. Sir Daniel Morris was elected Treasurer in 1888 at the moment of crisis when the Society had very little to be treasured. He was one of the chief agents in establishing the new policy of the Society, and had already restored its finances when in 1891 he received an appointment in the West Indies. He is now a member of the Council. The Rev. W. Wilks became Secretary when Sir Daniel Morris became Treasurer, and remains Secretary to this day. Probably he himself alone knows all that the Society owes to him, and he would be the last man in the world to relate it. But every Fellow is aware of something, a peculiarly courteous and tranquil efficiency, that distinguishes this Society from all others. It is to be noted not only in the more important arrangements of the Society, its flower-shows, its lectures, and all its public functions, but in its very circulars. Everywhere one notices a guiding touch that seems to be no more than a touch, and it is always the touch of the Secretary. He is also famous as the originator of the Shirley Poppy, perhaps the most beautiful of all annual flowers; and every year he gives seed from his own strain to every Fellow who cares to ask for it. That may seem only one of the minor benefits of the Society, but it is a very pleasant one.

The Society was founded in 1804 with the name of the Horticultural Society of London, mainly at the instance of Thomas Andrew Knight, F.R.S., with the help of Sir Joseph Banks, P.R.S. It flourished at first and in 1809 received a Royal Charter of Incorporation. In 1818 it established gardens in Kensington and a nursery at Ealing; but in 1822 the gardens were moved to Chiswick. In 1818 the Society began to import new shrubs and flowers from China and India, one of the most important of these being *Wistaria sinensis*. In 1821 it began to send collectors of its own abroad, among whom were David Douglas, Theodor Hartweg, and Robert Fortune. Douglas brought from North America, among many other things, *Pinus nobilis*, *Pinus insignis*, *Abies Douglasii*, and the first Clarkias, Eschscholzias, Godetias, Lupins, and Pentstemons. Hartweg brought over 2,000 plants from Mexico and South America; and Fortune brought from China *Dicentra spectabilis*, *Weigela rosea*, *Jasminum nudiflorum*, and the Tree Pæony. He also introduced the culture of tea into India, so that his mission had results of the first importance to the Empire.

Unfortunately, the Society incurred very heavy expenses, and to meet these imposed an entrance fee of £6 6s. and a subscription of £4 4s. This caused a decline in the number of Fellows, and the finances of the Society became insecure. Meanwhile it was holding fortnightly shows in Regent Street and more important ones at Chiswick, which had the strongest influence upon the horticulture of the time. But

the success of these shows did not improve the finances. Indeed, after 1851 the Chiswick show began to entail heavy losses. The Society had not yet learnt that it could only prosper securely if its prosperity were based upon the subscriptions of a multitude of Fellows. It made many sacrifices and tried many new experiments; but in 1858 it had only 985 Fellows and was in debt to the extent of nearly £10,000. Its services to the horticulture of the country had been vast, but they were not recognized in any practical way.

In 1858 the Prince Consort became President of the Society; 20 acres of land in South Kensington were then leased from the Royal Commissioners of the Exhibition of 1851, and the gardens were elaborately laid out at a great cost. This again was a mistaken policy; and on the death of the Prince Consort in 1861 things went from bad to worse. The Society made no profit out of its new gardens and could not pay its rent. It had lost sight of its proper purpose, which was to "foster and encourage every branch of horticulture," and so had lost the support of its Fellows. In 1887 the South Kensington gardens were given up, and the Society, changing its policy, began its present career of prosperity.

Since that time it has been a Horticultural Society and nothing else. Its object has been, not to provide entertainments for the public, but to make itself useful to gardeners; and every new event in its history has increased its usefulness. In the first place the subscription has been lowered to £1 1*s*. a year. That is to say, a Fellow need pay no more than that and £1 1*s*. entrance fee. He may pay £2 2*s*. or £4 4*s*., in which case he will have more privileges. Every Fellow has a right to attend all the shows and lectures of the Society and has extra tickets, varying in number according to the amount of his subscription. He receives a copy of the Society's Journal, which is published quarterly and which contains reprints of the Society's lectures, reports upon horticultural experiments at Wisley, and much more useful matter. He has the right to use the Lindley Library, which is kept in the Society's hall, to purchase at reduced rates fruit and vegetables which are not required for experimental purposes, and to a share in surplus and waste plants which are distributed annually. He can also obtain analyses of manures, soils, &c., or advice on such subjects, by letter from the consulting chemist of the Society subject to certain fees and limitations. He can on payment of a fee have his garden inspected by the Society's officer. He can exhibit at all shows and meetings; and he can send seeds, plants, &c., for trial to the Society's gardens.

The usefulness of the Society has been much increased in late years by certain acquisitions which I will mention in order. In 1903, by the generous gift of Sir Thomas Hanbury, the Society became possessed of the beautiful gardens at Wisley, in Surrey, which were made by Mr. G. F. Wilson. Mr. Wilson was, perhaps, the greatest gardener of his time; and the Wisley gardens are unsurpassed as an example of wild gardening. Many rare and difficult plants flourish there as if they

grew wild. There are 60 acres altogether, and the Society, besides preserving Mr. Wilson's garden, have established a school of practical and scientific horticulture where experiments are made with many different kinds of plants and where students are trained both in theory and in practice. Students receive a diploma at the end of a two-years' course if they pass their written and practical examinations, write essays upon some approved subjects, and submit a collection of at least 200 properly dried, named, and localized plant specimens collected outside the gardens, and also a collection of insects either injurious or helpful to plant life. The Society also awards scholarships at its discretion, and every student has the opportunity of studying all kinds of horticulture. During the last year 38 students have worked at Wisley, of whom 13 have gained the Society's diploma; and of these all except one have obtained gardening situations. The Board of Education report that the course of instruction is extremely well planned and carried out by an efficient staff. The Society also hold annual examinations in the principles and practice of horticulture in two divisions, which are open to all students, not only in the British Isles, but also in India and the Colonies. The examination will be held this year on April 5 and names of candidates must be received by March 22. In 1902 the Society resolved to build a new hall and offices in commemoration of its coming centenary. This hall was urgently needed for shows, for lectures, and meetings, for the library, and for office work. It became possible mainly through the generosity of Sir Henry Schröder, who gave £5,000 towards it. An excellent site was found in Vincent Square, and the hall, which was opened in 1904, proved to be excellently fitted for all its uses. There fortnightly shows are held throughout the year, which are of the greatest interest and value to Fellows and to all interested in horticulture. The hall also contains the Lindley Library, consisting of 7,000 volumes and pamphlets, of which the Society is the sole trustee, and which all Fellows can consult.

In 1907 a laboratory for scientific research was established at Wisley and is already proving very useful. The Director is Mr. F. J. Chittenden, F.L.S., who is also Editor of the Society's Journal.

Three hundred local horticultural societies are now affiliated to the Society, which has established a union of Horticultural Mutual Improvement Societies with the object of helping such societies in every possible way. As to the shows of the Society, they occur, as I have said, fortnightly, and always in the Horticultural Hall, excepting the great Spring Show, which is held in the gardens of the Inner Temple, and the great Summer Show, hitherto held in the gardens of Holland House, but this year to be held at Olympia. All of these shows are broadly horticultural in their purpose. Their aim, that is to say, is to encourage the general culture of plants and the introduction of new species and varieties, rather than the production of individual flowers according to the old show standards of perfection. Committees sit at these shows and give medals, certificates, and awards of merit to different exhibits and to new plants. Some of these shows are general, others

have a special object. This year, for instance, there is a Spring Bulb Show on March 14 and 15, an Auricula and Primula Show on April 25, a Sweet Pea Show on July 11, a Carnation Show on July 25, an Autumn Rose Show on September 14, a Vegetable Show on September 26, and an Autumn Show of British Home-Grown Fruits on October 10. Last year in December the Society held a show of Colonial-grown fruit and vegetables, both fresh and preserved, which was most successful. Those who attend the shows of the Society may be sure that they know all that is being done in horticulture. They will see all the new plants that are introduced and will be able to learn something about their culture. Without them gardening in England would be a disorganized art, and new plants would only become known slowly by hearsay or advertisement. In fact, the shows alone give to every Fellow who chooses to attend them far more than the value of his subscription, and they are only one of the many benefits of the Society. It has the eager support both of professional florists and of amateur gardeners. It is probably as little criticized as any Society in the kingdom, although gardeners are very critical people; and it deserves even a greater prosperity than it enjoys.

COMMONPLACE NOTES.

By the Secretary, Superintendent, and Editor.

Use of Acetylene Residue.

We are frequently asked whether the residue from the calcium carbide used in the generation of acetylene gas has any value in the garden.

Calcium carbide is made by heating lime and charcoal together in an electric furnace. The calcium and carbon combine and the compound thus formed interacts with water when it is moistened, setting free acetylene gas, and leaving behind slaked lime as a white residue. If the substances used in the manufacture of the carbide were quite pure, nothing but slaked lime and any excess of water used would remain; but there are almost always some compounds of sulphur and lime, and phosphorus and lime formed, which might have an injurious action upon plants if they came in contact with them. These substances are, however, present in very small quantities, and if the residue be exposed to the air for two or three weeks the former become oxidized and quite innocuous, while the latter are never present in such quantities as would be likely to do harm. After exposure to the air for a little time, therefore, the residue is exactly the same as the material obtained by slaking ordinary burnt lime and allowing it to be similarly exposed (with the addition of a very small proportion of harmless impurities), and it may be used for any of the purposes for which ordinary slaked lime is used.

If, therefore, the residue is first exposed to the air for a time before it comes in contact with the roots of plants, it may be spread on the soil at the rate of about half a bushel to the square rod, as evenly as possible, and then dug in, and all the beneficial effects of the application of slaked lime to the soil may be expected to follow. It will counteract sourness in the soil and mitigate the evils which arise from that condition, and in clay soils will cause the minute particles of clay to coagulate and make the soil more porous, easier to work, better aerated, and warmer than it was before.

It is also said to be of value in cesspools (see "Journal of the Board of Agriculture," 1909). The refuse may be run into the cesspool, and the lime will cause all solid matter to settle, leaving a clear liquid. The solid precipitate may be dug out at the end of the year, and will form a valuable manure.

Suggested New Stock for Pears.

Our attention has lately been called by one of our Fellows to a new stock for Pears—viz. *Pyrus ussuriensis* (=*P. sinensis.*) We understand that it has hardly (if at all) been tried in this country, although

for some years past hundreds of thousands of seedlings of it have been raised in the United States of America for grafting purposes, which fact alone would suggest that it must be in some way superior, or our very practical American cousins would not be so keen for it. It has also been somewhat extensively used in Australia, and is not unknown in South Africa. The United States alone is said to take twelve to fifteen hundred pounds weight of seed a year. It is a fairly common plant in the Northern Island of Japan, from whence the seed is exported. It is described as being "a strong, healthy, vigorous-growing tree with good foliage calculated to withstand diseases and pests," and it is these qualities which, it is suggested, make it such a favourite stock in the States. We are a little sceptical of its merits, but it should certainly be tried in this country. We understand that sample seeds can be obtained from Mr. Unger, Schlierbach, Heidelberg, Germany.

British Columbia.

We are constantly being consulted and asked many questions by Fellows who have friends thinking of going out to British Columbia. We have therefore collected a few of the more prominent details relating to one of the more immediately fruit-growing districts of that rapidly increasing Colony.

British Columbia is on the Western or Pacific Coast side of Canada. It enjoys a climate not colder in winter than ours here in England, and far less changeable and capricious. In summer it is decidedly warmer and more sunny, but at the same time is seldom without fresh breezes from the snow-clad mountains on the north-east and south-east, and from the Pacific Ocean on the west.

British Columbia must not be confused with Colombia, which is a South American State of more or less Spanish origin, and lies in the blaze of the Tropics, just south of the Isthmus of Panama. It is hardly possible to imagine two countries more unlike each other than Colombia in the south and British Columbia in the north, separated by the vast stretches of the Isthmus of Panama, Mexico, California, and Oregon.

Notes on the Fruit-growing District of Vernon, British Columbia.

Vernon, the chief city of Okanagan Valley, has a population of about three thousand people, and lies about forty-five miles south of the Canadian Pacific Railway, with which it has daily train communication.

At an elevation of about twelve hundred feet, Vernon is most advantageously situated as a centre from which radiate excellent roads leading to the northern towns of the Valley, to Coldstream, White Valley, and the rapidly growing large district about and beyond Lumby, and to Grand Prairie and Kamloops. Daily communication is also kept up with the towns on Okanagan Lake by swift steamers, equal in comfort and speed to anything in British Columbia.

The city is built on one of the most beautiful sites in British Columbia, and the magnificent scenery around continually charms the settler and lingers for ever in the memory of the traveller. About two miles distant is Long Lake, the beauty of which it is hard to describe. It stretches for over ten miles, gleaming in the sunshine like a beautiful flashing blue sapphire. Two miles in another direction lies Swan Lake, well known for good duck shooting; while four miles to the south Lake Okanagan stretches away for a distance of about ninety miles in the midst of the finest scenery in Canada, with several quickly growing and prosperous towns on its shores.

The Okanagan Valley is famous among other things for its climate, and Vernon is particularly favoured in this respect. The heat of summer is seldom, if ever, oppressive, the air being dry and the nights cool and pleasant. The glory and delight of an Okanagan summer, lasting as it does from April to November, is something to be experienced and enjoyed. Many people spend the summer in camp on the lake shores, and good bathing, boating, and fishing form part of the summer recreations. The winter lasts from about the beginning of December until the end of February, and the weather is pleasant indeed compared with the extreme cold in Eastern Canada; while in comparison with the winters in the Old Country, with their terrible fogs, rain, and bitter winds, this district may be considered a Paradise (see p. 635). The winter sports include sleighing, skating, curling, and hockey.

The city is in the central part of the Valley, and has many important business houses carrying large stocks of all sorts of goods. Among the labour-employing industries are saw mills, window-sash and door factories, brickyards, cement works, &c., and there is an ever-increasing demand for labour in connexion with the fruit business. Vernon has two newspaper and printing offices and branches of the Bank of Montreal and Royal Bank of Canada. Six hotels offer every comfort and luxury to suit all comers. The city is also particularly well off as to educational advantages. A first-class new public school has just been erected at a cost of about £10,000, and there is also an up-to-date high school. Children have every chance to get a thorough education and, if they wish it, prepare for college matriculation. The Provincial Government Office and the Court House for the Okanagan district are located here. The different religious bodies are well represented. The Bank of Montreal Company has just completed a very handsome new building at a cost of about £10,000, which is in itself a good indication of the future that Vernon is expected to have. The building of a large new Post Office and Customs House has been started, and a site has been purchased for a new Court House. A hospital for the Valley equipped with every modern appliance has just been erected at a cost of over £10,000. The city has, in fact, now reached a very high standard in every way, and is second to none in British Columbia. It has an excellent water supply, electric light, and a telephone system connecting Vernon with many outside points.

A sewerage system was installed last year. Two companies are already established for the handling of fruit and similar produce in connexion with the markets, and the place undoubtedly has a great future before it as the centre of the finest fruit-growing district in Canada. Within two or three years there will be two millions of trees bearing fruit in the Valley, and Vernon will undoubtedly be the central point for the very large business which will result. Our markets in the North-West Territories are practically unlimited, and thousands of new settlers pour in there year after year in ever-increasing numbers out of all proportion to the increase of bearing orchards. Vernon fruit is already well known, and a large proportion of the British Columbia exhibits which have been shown at the R.H.S. Shows of late years has been composed of Okanagan fruit. These exhibits have gained the highest awards, the Gold Medal of the Society having been won more than once. Besides apple-growing, the climate and soil are eminently suitable to the growing of pears, plums, peaches, and cherries, while strawberries and other small fruit and vegetables can be grown to perfection. A distinct and most valuable point in connexion with the Vernon district over many other localities is said to be the fact that the great fruit pests, Codling Moth and San José Scale, are unknown, and the strictest precautions are taken by the Government and people to prevent their introduction.

A special point to be noticed with reference to land around Vernon is that most of it requires no clearing at all, and the remainder can be very easily cleared. This is a point in favour of the new settler, as he may start getting his land into shape and planting his trees the moment that he has arranged his purchase, instead of having to wait for a year or two before he has his land cleared sufficiently to start fruit-farming.

The social life of the district is very enjoyable. There is, it is said, an entire absence of the rough element to be found around towns in mining districts. Fruit-growing does not attract the lazy man, and the Okanagan Valley is consequently peopled with a good class of well-educated, industrious, and desirable settlers. The free-and-easy life, the absence of formality, and the pleasure of living almost entirely in the pure open air appeals to many a man, not only for himself, but on account of his family. Probably no country has a future before it like Canada, and no Province in Canada has a brighter prospect than British Columbia, while it is claimed that no district in British Columbia is so highly favoured with climate and excellence of soil as Vernon.

With regard to the disposal of fruit there are available not only the local markets and those of the rest of Canada and of Great Britain, but satisfactory beginnings have also been made in the shipment of apples from Vernon to Australia, New Zealand, China, and elsewhere on the opposite shores of the Pacific Ocean. The Australian and New Zealand market is particularly attractive, because, being antipodean, their seasons are the exact opposite to British Columbia,

and are exactly suited to the British Columbian fruit harvest. When British Columbia wants apples in spring and early summer Australia and Tasmania are just harvesting theirs, so that a balance of trade may be struck. As a matter of fact, for some years past small parcels of Tasmanian apples have been on the British Columbian markets in the off-season.

The North-West Territories of Canada provide an unlimited market. The enormous increase each year to the population there by the thousands of new settlers now pouring in is entirely out of proportion to the increase of orchards coming into bearing.

The Grey Canal, in the vicinity of Vernon, is a typical example of irrigation work in a hilly country. Immense sums of money have been spent throughout the irrigated sections of the United States in creating storage reservoirs, and their effect in equalizing the flow of the rivers throughout the year is very marked. But it is seldom that such favourable conditions are found for this purpose as in the Okanagan Valley. Lake Aberdeen, as the headwater of the stream supplying the Grey Canal is called, is a sheet of water four miles long, with deeply indented shores covered with a dense growth of spruce and pine. At a height of 4500 feet above sea-level the snow remains late. A large dam at the outlet impounds the water to a depth of 17 feet, but notwithstanding the enormous body of water represented by this difference in level, more than twice as much passes over the spillways each year and is lost. Lake Haddo is a smaller body of water just below Lake Aberdeen, and in it there exists an opportunity of increasing the amount stored to a very large extent if ever occasion should arise. As at present constructed, however, it is able to furnish abundance of water for all the land served by it. The stream known locally as Jones Creek flows in a circuitous course from the plateau of the lake, cutting its way through twelve miles of rugged cañons to the headgates of the Canal, whose bed width is 14 feet. Three miles from the headgates the Canal crosses a flat, where it is divided, and the whole flow can be diverted if necessary and emptied into a natural watercourse. Further on the water has in many cases to be carried across valleys and depressions. One of these syphons, a mile and a quarter long, carries the Grey Canal across a valley at Lavington. This valley is in reality the divide between waters which flow west to the Okanagan and east to the Thompson River and the Fraser. To have conducted the water across this depression in an open aqueduct would have required pillars 330 feet high. At the lower end or outlet of the syphon pipe the channel is again an open one, carved out of the hillside, and, by a very common optical illusion, it appears to be running uphill, ever climbing higher from the valley in its course, till at Vernon it is between 700 and 800 feet above the town.

After passing Vernon it runs north, and passes through the Land Company of Canada, more familiarly known as the Belgian Syndicate, again crosses the Valley, and on the west side of the Valley, in a hollow of the hills, runs into Goose Lake, which has

been converted into a co-operating reservoir by damming the outlet. Thence the Canal runs southward, again passing the town of Vernon on the opposite side of the Valley, but at a lower elevation. From this point it is taken south-west to Okanagan Lake, having travelled some thirty miles from its original source. This great work, when completed, with all its laterals, will have cost £100,000. What it means to the district around Vernon may be gathered by a visit to the fruit-growing districts of Washington—the famous Yakima Valley, with similar climate, soil, and other conditions—which to-day is what the Okanagan Valley and Vernon will be not many years hence.

In the Okanagan Valley in 1909 there were not more than 1200 to 1500 acres of orchards in full bearing, with perhaps another 1200 acres bearing very lightly in 1910, much of it being young orchard; and 3000 more acres were expected to be planted in 1910.

For comparison purposes the production may be taken at about one-twelfth of what it will be when the trees already planted have reached their full growth. As the trees not yet bearing range from one to six years old, in another six years at the most the fruit crop of the Valley (even at the present rate of yield from partially bearing trees) would be between 6000 and 7000 truck-loads annually.

To transport 7000 truck-loads of fruit in, say, a three-month season would take almost one hundred trucks a day for the working days. At an average of twelve tons to the truck this fruit crop would figure up to about 80,000 tons. It keeps one barge busy all day to carry eight truck-loads to and from the nearest lake point and the present rail end; if the same conditions existed in 1916 it would require a regular fleet of barges and tugs on Okanagan Lake to move the fruit crop along, without counting the output of vegetables and field produce, which would undoubtedly keep pace in production.

That the figures given above are under the mark of an average crop from a fully producing orchard is shown by the following:—

An apple orchard will average fifty trees to the acre.

A peach orchard will average 100 to 150 trees to the acre.

A full-bearing apple tree will carry more than ten boxes each year.

A peach tree in the fourth year should yield about ten crates of 20 lb. each.

Apples run about 550 boxes to the truck-load.

Peaches, plums, &c., about 1000 crates.

Apples, at ten boxes to the tree and fifty trees to the acre—a very moderate estimate—would give one truck-load to the acre.

Peaches, with ten boxes to the tree and but 100 trees—less than the average to the acre—would give also one truck-load an acre.

Figuring on that basis, every acre of fully bearing orchard would yield a truck-load of fruit. In other words, the 15,500 acres of orchard trees which will be in full bearing in 1916 would yield 15,500 truck-loads of fruit—a stupendous total, yet one quite within the range of possibility.

To this great total must be added the production from fresh trees

to be planted between now and 1916, for some of these, especially peaches, apricots, and the like, would be in practically full bearing, maturing as they do in four or five years.

If the rate of increase in acreage of orchard trees keeps up to the present ratio of about 20 per cent. of the area already planted, then in 1916, without making any allowance for new sections of land not yet put on the market, there will be some 33,000 to 35,000 acres of planted orchard in the Okanagan Valley alone.

From statistics furnished by a correspondent it appears that in 1910 the extreme range of temperatures for each month were as follows:—

	Min.	Max.		Min.	Max.
January	−6°	50°	July	42°	107°
February	−7°	49°	August	35°	101°
March	28°	72°	September	35°	91°
April	28°	92°	October	26°	67°
May	33°	99°	November	26°	56°
June	40°	102°	December	2°	50°

* * * * * * *

The following extract from a Fellow's letter will be read by many with interest:—

Mount Tolmie, Victoria, B.C.

. . . I have been very busy lately clearing 160 acres of forest land and building a house. I paid $6,000 (£1,200) for it, and have got 20 acres cleared and drained and under crops, and 40 acres slashed ready for the fire next summer.

It seems such a pity to destroy such beautiful trees—Douglas spruce 4 to 5 feet in diameter and over 200 feet high! I sold some of the best timber to loggers, but they only gave me a price which was positively not worth bothering with, and they make an awful mess, only taking the best trees and the best part only of those.

It is very hard work clearing land and very expensive. We blast the large stumps out, then haul them together with a team of horses hitched with cable and blocks. We then burn them, cutting and splitting logs to feed the big fires. My son and I worked at the 20 acres already cleared all last winter and the spring before with two men, and did all the blasting ourselves.

Douglas spruce (*Abies Douglasii*, *Picea grandis*, *Cupressus nootkatensis*, *Thuja gigantea*, *and Acer macrophylla*) are the principal trees on the place. The Cypress and Maples are very beautiful. We also have a small tree, very beautiful when in flower, *Cornus Menzesii*. The shrubs and ferns also are very beautiful, and it seems hard to destroy them all. I had a damp spot of about an acre covered with nothing but ferns and thimble-berrys (*Rubus occidentalis*). They were lovely, but we had to cut them all down when they were in bloom last spring, and it was a tough job ploughing that land—nothing but a mass of roots and ferns; they had been growing there so long that they had formed a bed of peat several feet deep. We used to

start this at 4 o'clock in the morning, so you see we are early risers. . . .

Chinese Huskless Oats in Nyasaland.

A friend of a Fellow of the Society called upon the Secretary in the early autumn of 1909 before returning to Nyasaland, where he is farming. He is conducting many experiments in fruit and grain growing, and about twelve months ago he sent his first small consignment of apples. Considering the long time taken in transit and the difficulty of transport they arrived in very fair condition, enabling one to see that the produce was of good quality. Flavour was somewhat lacking, as might be expected, for the fruit had to be gathered while still unripe and had to travel far through very hot regions.

Mr. Cameron being anxious to experiment with the huskless oat, seed was procured for him from China, and sent out to him. The following letter tells of the results obtained:—

Ntondwe, Zomba, Nyasaland :
November 17, 1910.

I write to thank you for the huskless oats received about a year ago, and to let you know that they have been so far a remarkable success.

I sowed half of the seed and about a score of plants came up. These were reduced by insects to about half this number, and again reduced by rabbits until I had only five plants remaining. These I protected every night by placing a basket over them so that the rabbits could do no further harm. They were planted just before the rains, and by the time the wet season was over they began to get ripe. No sooner were they cut down than they began to produce a number of suckers which gave a second crop. These suckers, I find, can be detached from the plant and cultivated individually with success.

From some of the seed obtained from this crop I planted eleven lines forty-six feet long, two feet between the lines and one foot apart in the lines during the dry season and watered by irrigation; besides, another four lines in soil naturally damp, marshy soil, or here called a dambo. To commence with, the oats were thinned out by the mole-cricket and other grubs, and I was afraid they were going to be rendered a total failure by a variety of green fly which attacked the survivors. The plants, however, grew fully seven feet high, and are now ripe and are at the same time producing a second crop of suckers which are coming into ear.

Taking one head or spike, from this was obtained 130 grains; and, remember, each plant produces a number of heads. The spikes you sent out were eight inches long; some of the spikes grown here are fully twenty-eight inches long! On yours the distance between the joints in the spike is about two inches, while here it is fully five inches. I noticed one plant only about three feet high, and the spike weighed down with seed, its point actually touching the ground.

From what I have as yet seen of these huskless oats here they are capable of standing severe drought, and for this reason should be of great importance in this country. No trace so far of rust was discernible. The straw may be also of use as a feed for cattle, as they eat it readily.

The oats planted in the dambo are also doing well. I have not yet tried them cooked.

K. J. C.

Strawberries on Light Soils.

It is often difficult to obtain an unbroken supply of strawberries for dessert and large quantities for bottling and jam-making on very light soils, and some of the finer flavoured varieties will scarcely succeed at all. There was planted at Wisley six or seven years ago a fairly representative collection of over forty varieties. The collection has been maintained, but we find that by the end of the first year some begin to show signs of their dislike for the soil: by the end of the second year there are a great many blanks: and before the third season is very old the greater number of the plants are dead; and this is unfortunately the case with many of the best varieties. To overcome this trouble we have annually layered runners in 60-sized pots in good soil, and immediately they are well rooted they have been planted in well-manured and thoroughly prepared beds, in the hope that by giving them every attention at the start we might succeed in establishing good beds. We have also tried mulching with farm-yard manure in the autumn and winter months, and allowing the mulch to remain during the summer months, as is the custom in many gardens. Mulching has been given in the spring, and at once dug in, and, although not generally recommended, we have found this the most profitable course to pursue on our sandy soil, as the plants seem to go through a dry spell better. Even then the results are not good with many varieties, and out of the forty tried there are only half a dozen which make really good rows and continue to fruit for two years, no matter what trouble we have taken. We are fortunate, however, in having in these half-dozen varieties all that is required for a supply of dessert fruit and fruit for jam-making.

Our best six varieties are 'Aprikose,' 'Climax,' 'Cropper,' 'Fillbasket,' 'Royal Sovereign,' and 'Scarlet Queen.' Of these 'Scarlet Queen,' in company with 'Royal Sovereign,' supplies dessert fruit of the best, and both sorts will force well, whilst for cooking and preserving we have 'Climax,' 'The Cropper,' and 'Fillbasket.' These bear very heavy crops of fine fruit, and stand well on our soil, bearing good crops the third season, as no others do. 'Bedford Champion,' 'Filbert Pine,' 'Kentish Favourite,' 'Monarch' 'Mentmore,' 'The Laxton,' and 'Yarles,' make moderately good growth, but before the fruit is gathered the second year many of the plants collapse. The list of weak and poor growers must be a long one, some of the following sorts being so weak by the end of

the first year that only occasional plants live into the second season, and it is with difficulty that runners can be taken and induced to grow, no matter what pains are taken over the plants and young runners. 'Givons' Late Prolific,' 'Gunton Park,' 'Empress of India,' 'Dr. Hogg,' 'British Queen,' are unfortunately among them. That fine strawberry 'Lord Suffield' is very shy indeed; in fact, it is difficult to realize that it is the same variety as we have grown elsewhere, so poorly does it grow here.

'La Grosse Sucrée,' 'Leader,' 'Latest of All,' 'Latest,' 'La France,' 'Noble,' 'President,' 'Reward,' 'Sensation,' 'The Captain,' 'The Bedford,' Trafalgar,' 'Veitch's Perfection,' do not grow well on this soil. 'Vicomtesse Hericart de Thury,' so useful in many gardens, can be induced to grow, but the fruits come so very small that it cannot be included among the well-doers. There are several other sorts which do not do well, but the 'Alpine' and the 'Perpetual' fruiting varieties are quite satisfactory.

WISLEY SCHOOL OF HORTICULTURE.

Eleven students completed the two years' course of instruction at the Wisley School of Horticulture during the year 1910. Four sat for the Diploma examination at the end of March, and seven at the end of July. As in the past two years, the examinations included written and practical papers in the Principles and Operations of Horticulture, Mr. John Fraser, F.L.S., acting as external co-examiner, with the Director and Superintendent. Each candidate was required, in addition, to present an essay on an approved horticultural subject, and collections of dried and localized plants and of useful and injurious insects. Marks were also credited for observations made during the year. Mr. James Hudson, V.M.H., kindly read through the essays presented.

Nine candidates satisfied the examiners, their names, in order of merit, being—

1. Mr. H. F. Clough.
2. Mr. J. W. McCaig.
3. Mr. R. McK. Robson.
4. Mr. W. Cartwright.
5. Mr. L. C. Dyer.
6. Mr. R. L. Brazier.
7. Mr. A. F. Leverett.
8. Mr. E. Krumbholz.
9. Mr. H. Lane.

Eighteen students entered for the Society's General Examination, and all were successful (p. 451).

Two students, Messrs. A. Simmonds and J. W. McCaig, entered for the Board of Education Examination in Rural Science, 2nd Stage, Subjects B (Soils) and D (Horticulture). Both passed in both groups in the First Class.

The following prizes (books) were awarded on the results of the Diploma examination:—

Special prize, of the value of £2 10*s*., to Mr. H. F. Clough (who was not able to accept the Student Demonstratorship offered him).

Prizes provided by the income of the "Sutton Prize Fund," of the value of £1 10*s*., £1 2*s*. 6*d*., and 17*s*. 6*d*., to Messrs. J. W. McCaig, R. McK. Robson, and W. Cartwright respectively.

"Nicholson Prize," of the value of £2 2*s*. (provided by the income of the "Nicholson Memorial Fund"), for observations on the Flora and Fauna of Wisley and its neighbourhood, to Mr. J. W. McCaig.

Prizes to the value of £2, £1 5*s*., £1, and 15*s*. to Messrs. H. F. Clough, R. McK. Robson, L. C. Dyer, and J. W. McCaig respectively for the best collections of plants and insects made during the two years' course. These prizes were most generously offered by Mrs. G. F. Wilson, of Weybridge.

THE WORLD OF LIFE: AN APPRECIATION AND A CRITICISM.*

By the Rev. Prof. Geo. Henslow, M.A., F.L.S., V.M.H.

This is an extremely interesting book, containing twenty chapters dealing with such questions as—What is Life, and whence comes it? the Number of Species and their Distributions; Heredity, Variation, and Increase; Natural Selection and Adaptation; the Progressive Development of the Life-World; some extensions of Darwin's Theory; General Adaptations of Plants, Animals, and Man, &c. There are also 110 illustrations and index.

The title will surprise some readers, since the author and Darwin both propounded the theory of natural selection. This theory was seized upon by German philosophers as the very basis of the Haeckelian atheism! Thus writes Haeckel: "Darwin gave us the clue to the monistic explanation of organization. . . . Mechanism alone can give us a true explanation of natural phenomena, for it traces them to their real efficient causes, viz. to blind and unconscious agencies."† So, too, Büchner says, in his *Last Words on Materialism*, "Darwinism is the chief support of Materialism or Monism."‡

Dr. Wallace does not hesitate to say much against Haeckel, who "rules out the three central dogmas of metaphysics—God, freedom, immutability."§

On the other hand, the author upholds *natural selection*. Thus he describes rabbits, let loose in Porto Santo, four and a half centuries ago, as having changed in colour and structure, &c. He concludes: They show "how Nature actually works in the production of slightly modified forms through 'variation' and 'survival of the fittest'; [this] will, I think, render the process of species-formation sufficiently intelligible." Another case was that of 136 "common sparrows," which were found benumbed after a great storm in Rhode Island. When warmed, seventy-two survived. Of these the males showed a superiority over the females: the smaller and lighter birds prevailed. But this has nothing to do with the *origin* of *species*. Similar results occur with man. Vast numbers perished on the return from Moscow; still, many others survived. Every female is said to have perished on that terrible retreat.

There was no doubt about their all being "common sparrows," and not even "varieties." So, too, with regard to the rabbits. They were smaller than English rabbits, being little more than half the

* *The World of Life: a Manifestation of Creative Power, Directive Mind, and Ultimate Purpose.* By A. R. Wallace, O.M., F.R.S. 8vo., 408 pp. (Chapman & Hall, London, 1910.) 12*s.* 6*d.* net.

† *Riddle of the Universe*, pp. 264, 265. ‡ *Op. cit.*, 139.

§ *Op. cit.*, p. 83.

weight. The author then proposes to "enumerate briefly the exact causes [?] which must [?] have been at work in bringing about the changes [?] in the rabbits of Porto Santo." "Up to this time, perhaps not more than a dozen or twenty years from their first introduction, *they would have varied* in size and colour, as do common domesticated races, from which Darwin thinks they were undoubtedly derived." Then follow seven "causes" which "would" operate. He concludes: "We thus see that all the changes that have occurred have no relation whatever to mere 'isolation,' which many writers still persist in claiming as a *vera causa* of specific change."

Of course, "mere isolation" is not the "cause," but the "direct action of the *changed conditions* of life," of a new environment, as Darwin says,* produces the "results" which he calls "definite," when *all* the individuals vary alike, by means of the responsive power of life, in adaptation to those conditions, "without any selection."

The words we have italicized—viz. "they would have varied"—lie at the root of the matter. What we want to know is, *Why* did "grey" become "reddish-brown," and *why* did the size decrease?

If they are *all* of the latter colour now, the "numerous enemies," which at first selected the "larger, more bulky, and slower-moving individuals," still keep them down, though smaller and reddish-brown, and, one supposes, maintain the average number. But surely "hawks, buzzards, falcons, and owls" would not really be so discriminating. Would they not pounce upon the first they could see, whatever the pace, colour, and size? The fact is, Darwin's title was misleading. New species do *not* arise "by means of natural selection," but (and he confesses, in his letter to Wagner, that it was his greatest mistake in overlooking it) by the young animal or plant *responding* to the changed conditions of life. These excite the variability in the organisms, and adaptive changes in its colour and structure follow accordingly.† Hence *Darwin eliminates natural selection altogether.* In its place is what he calls "fortuitous destruction."

Sir E. Ray Lankester gives an excellent illustration of this in the case of the oyster. He tells us that a single oyster may discharge upwards of a million eggs. Fishes, &c., devour enormous quantities. Others fall on unsuitable places. So that—as the average oyster population remains the same—perhaps one only falls on a suitable spot. What is true of one is true of all oysters. There is obviously no selection, only fortuitous destruction. Nevertheless, there *are* varieties of oyster, found in different situations—smaller, longer, and of different characters.

Dr. Wallace would eliminate the "less adapted" by destruction; but Darwin maintains that *all the offspring can vary alike*,‡ and there-

* *Animals and Plants under Domestication*, ii. p. 271 ff.

† We shall see that Dr. Wallace recognizes this below.

‡ *Origin of Species*, &c. Sixth edition, p. 80: "All the individuals varying in the right direction . . . will tend to be preserved." In First edition: "Natural selection will always tend to preserve all the individuals varying in the right direction."

fore, after the first twenty years, which Dr. Wallace allows for varying in size and colour, they would be all alike. But twenty years is an arbitrary number. The possibility is they begin to change in the first generation. Plants certainly do so.

The fact is that Darwin's two alternative explanations of the Origin of Species are mutually exclusive. *The origin of species by means of natural selection* depends upon a *chance* appearance of one or more among many variations, which may be in adaptation to, but quite irrespective of, the environment.

The *Origin of Species by Response* depends upon the immediate appearance of adaptations in every individual, such being due to the *responsiveness of life* to the "direct action of new conditions of life," *all the individuals varying alike* with the same adaptation, and without any selection whatever (Darwin).

No facts, without the necessity of additional assumptions, have ever proved the first to be true.

Abundance of facts have proved by wide inductions, as well as by experimental verification, that the latter is always the case.

Dr. Wallace appears to try in some way to make the latter method to be an "extension of Darwin's theory"; but this is impossible, from the very conditions necessary, for Darwin shows that, if the results are ". . . indefinite as required for natural selection," then they cannot be "definite," and vice versa. Dr. Wallace says: "But a few years ago an idea occurred independently to three biologists of a self-acting principle in Nature which would be of such assistance to any species in danger of extermination as, in some cases at all events, would enable it to become adapted to the new conditions." *

Dr. Wallace continues to say that: "It would, in fact, increase the powers of natural selection." He takes as his illustration the *use* of limbs, Lamarck's contention, and he applies it to the running powers of animals, the better runners surviving by escaping their enemies. He does not admit an heredity in such an acquired character; only "the quality of being improvable during life would be transmitted." Why "improvable" by inheritance, if the improvement of an organ acquired during the life-time be not inherited; for there would remain nothing but the capacity for improvement, inherent in all organisms for life only?

In Chapter XIV. we reach the most important development. It is headed "Birds and Insects: as Proofs of an Organising and Directive Life-Principle."

Dr. Wallace speaks of elements and their compounds as organic *products*, and observes that "large numbers of them have been produced in the laboratory, but always by the use of other organic products, not from the simple elements used by nature." †

* Who these three may be the author does not tell us; but Sir A. H. Church saw the importance of what he called "Directivity" of life in 1862; Mr. James Croll that something must "determine" molecular motion in 1872. M. Constantin and myself published books on "Self-Adaptation" in 1888, though I first thought of it in 1869; and Warming said the same thing in 1892.

† P. 292.

The eminent chemist, Sir A. H. Church, wanted a word to express the following fact, and coined the term "Directivity" in 1862 "to avoid the use of 'force,' 'energy,' &c., when describing in lectures on organic chemistry the parallelism between the chemist *directing* in his laboratory physico-chemical forces in the making of a true organic compound and that mysterious something which employs the same forces to make the same compound in the plant or animal."

Dr. Wallace, is wrong, therefore, in saying such compounds are made "always by the use of organic products," as, *e.g.* Alizarine (madder) from coal-tar. Sir A. H. Church, on the other hand, says: "Many compounds previously known only as products of animal and vegetable life have now been made under the direction of the chemist from *purely inorganic sources*, that is, from their elements, and *without* having recourse to such substances as are derived from coal-tar. It is to such compounds that I first used the term 'Directivity.'"

Dr. Wallace endeavours to combine this "directive agency," as he calls it, with natural selection; but they are *mutually exclusive*. He described the chemist's procedure in making organic products, but rightly adds: "The more important of the constituents of living organisms [*e.g.* Protoplasm] remain far beyond his powers of synthesis." *

Dr. Wallace notes that Professor Max Vesarne, while strongly repudiating the idea of a "Vital Force," "gives no clue whatever to the existence of any *directive* and *organizing* powers such as are absolutely essential to preserve even the unicellular organism alive, and become more and more necessary as we pass to the higher animals and plants, with their vast complexity of organs, reproduced in every generation from single cells . . . till the whole body, limbs, sense, and reproductive organs are built up in all their perfection of structure and co-ordination of part, such as characterizes every living being!"†

Why does he not go one step further, and apply this "directive agency" to the evolution of *changes of structure*, to *make them* become in adaptation to new conditions of life, *i.e. Variations*?

He then illustrates this by the feathers of a bird, and describes the hooking process by which the "barbicels" of one "barbule" cling to those of the next, in order to make a rigid surface to the wing.

Dr. Wallace adds: "What, then, is the *selective* or *directing* power which extracts from the blood at every point where required the exact constituents to form, here, bone-cells, there, muscle-cells, &c., &c.?‡

"Now in none of the volumes on the physiology of animals that I have consulted can I find any attempt whatever to grapple with this fundamental question of the directive power, that in every case, first secretes, or as it were *creates*, out of the protoplasm of the blood, special molecules adapted for the production of each *material* bone,

* P. 329. † P. 294.

‡ This will be found in my lecture on "Directivity," see p 534.

muscles, nerves, skin, hair, feathers, &c., &c., and carries these molecules to the exact parts of the body where and when they are required, and brings into play the complex forces that alone can build up with great rapidity so strangely complex a structure as a feather adapted for flight." To this we may add—or as a limb for running, or a paddle for swimming, &c. Either as an *existing* well-established structure, or as any *new modifications* adapted to changed conditions of life as occur in all varieties and species; for all the above modifications of "limbs" arose somehow when required.

What is thus very true of *all* members of the animal kingdom is equally true of the vegetable. I have elsewhere shown that the flower of a *Salvia* has nearly thirty distinct features, every one of which has its "meaning" or "means" to an "end," viz. the transference of the pollen from one flower, on the back of a bee, to another flower of the same kind.* Twenty-two years ago my book was published on the *Origin of Floral Structures; by Self-Adaptation to the "direct action" of the visiting insects*, as Darwin would have said. Though it met with much pleasantry from some writers, I gather from Dr. Wallace that he perhaps would begin to take a slightly more favourable view of it than in 1888; for though the idea of 'Directivity' was not then to the fore, it underlies the whole work. Some grounds for this hope rest on the following words: "What we must assume is not merely a force, but some agency which can and does apply, direct, guide, and co-ordinate a great variety of forces . . . so as to build up that infinitely complex machine, the living organism, which is not only self-repairing, but self-renewing, self-multiplying, *self-adapting to its ever-changing environment*"— [The italics are mine].†

Dr. Wallace, in discussing cell-division, asks the questions about living protoplasm: "What power gave it life? It is also (in its essential part, the *nucleus*) already highly differentiated—it is *organized protoplasm*. What power organized it? . . . What power *determines* the cell-mass to take on this or other well-defined shapes? . . . Who or what *guides* or determines the atoms of the protoplasmic molecules into the new *combinations* chemically, and new *structures* mechanically?"

So, too, Mr. James Croll asked the same questions in 1872: "What determines molecular motion—the fundamental problem of life?"

Finally, Dr. Wallace observes: "This orderly process is quite unintelligible without some *directive organizing* power constantly at work in or upon every chemical atom or physical molecule of the whole structure."

What, then, can natural selection find to do, if *Directivity be so supreme*, as he describes it? Natural selection, after all, Darwin told us in 1859, is *only a Metaphor*.

* *Introduction to Plant Ecology*, p. 104.

† P. 338. The title to my other volume of the *International Scientific Series* is *The Origin of Plant Structures by Self-Adaptation to the Environment*.

I would most strongly advise all who are interested in this vast subject, "The World of Life," to read and study Wallace's book; only remembering that it is, of course, natural for the author to cling to his own theory of natural selection, though he has now discovered, what all plant ecologists have known for years, *i.e.* since Darwin, our first and greatest ecologist, put us on the right track in 1868.

BOOK REVIEWS.

"Garden Planning." By W. S. Rogers. Large 8vo., 328 pp. (Fisher Unwin, London, 1910.) 10*s.* net.

A beautifully printed and liberally illustrated book dealing with almost every phase of garden planning and making, very clearly written by one who evidently thoroughly understands what he is writing about, and to any contemplating making a new garden or adding to their present one this book will prove of valuable assistance.

"The Book of the Flower Show." By Charles H. Curtis. 8vo., 109 pp. (Lane, London, 1910.) 2*s.* 6*d.* net.

For secretaries and committees of Flower Shows and Horticultural Exhibitions this is a most useful volume, and the rules and regulations laid down are generally excellent. We have nothing but praise for the book, which is well printed and possesses a good index.

"Gardening for All." By James Udale. Ed. 4. 8vo., 177 pp. (Mark & Moody, Stourbridge, 1910.) 1*s.*

This is the fourth edition of this excellent little book for amateurs, cottagers, and others, and has been revised and brought up to date.

"City, Suburban, and Window Gardening." By D. Grant McIver. 8vo., 79 pp. (Dawbarn & Ward, London, 1910.) 6*d.* net.

This is another little book for the town gardener, and is well written and thoroughly practical, dealing with most of the subjects the suburban gardener requires information about.

"Window and Indoor Gardening." By T. W. Sanders. 8vo., 194 pp. (Collingridge, London, 1910.) 2*s.* 6*d.* net.

Window gardening has always been popular, and in some villages liberal prizes are annually given for window gardens, window plants, &c., and everyone will admit that where this is done the attractiveness of the village is greatly enhanced. In this useful and practical book the author not only clearly shows what may be grown, but also the best methods of growing it, with illustrations of the results. The book is well printed and well bound.

"A Primer of School Gardening." By Madeline Agar. 8vo., 135 pp. (Philip, London, 1910.) 2*s.*

A very serviceable book for all connected with school gardens. It is divided into two parts, the first dealing chiefly with the arrangement of the garden; and the second with annuals, biennials, perennials, bulbs, insect and fungoid pests, propagation, operations such as

budding, grafting, planting, &c. All will be found of great value to teachers and scholars in the elementary stage. There is no index, but the table of contents is so clear as to make one almost unnecessary.

"A Garden in Bog Land." By H. E. S. 18mo., 60 pp. (Siegle, Hill, London, 1910.) 2*s*. 6*d*. net.

We have no serious fault to find with this book, but the price is far too high for a little book only 6 by 4½ inches, and of only 60 pages. It is, however, artistically got up, and pleasant reading, but until the price is considerably lowered purchasers will not be very numerous, especially in these days when books on horticulture are to be had in such abundance at a small cost.

"Our Homestead and its Old World Garden." By Arthur Trower. 8vo., 280 pp. (Treherne, London, 1910.) 7*s*. 6*d*.

The author well describes his book as "A simple account of my old home, its garden, and its visitors. To me the work has been a labour of love, and while I am not altogether without hope, it will be read by some who, like myself, have a warm affection for country life, country scenes, and country people, more especially if the latter be a little bit old-fashioned, it still may be that a busy public has little inclination for, or time to give to, so homely a book as mine." The simplicity is the great charm of the whole book. It is teeming with pleasant phrases and delightful subjects such as all gardeners, rich or poor, will thoroughly enjoy. There is amongst the numerous excellent illustrations a capital photograph of the Rev. W. Wilks, and a warm tribute is paid to him as the raiser of the now universal Shirley poppy, with an account of the energy and perseverance he displayed in obtaining and fixing it. Everyone possessing a garden enjoys the visitor, and has more or less curious experiences with such folk, and readers will appreciate the chapters on "Our Visitors." Mr. Trower's experience is similar to that of many others. Visitors with a true love of gardening are always welcome, and the owner and his visitors are loth to part, but when one comes who really possesses no love of the garden, then the walk round is a weariness to both. The account of the offering of tips to Mr. Trower by visitors, under the impression that he was the gardener, is very amusing, and if it has the effect of preventing ladies and gentlemen offering tips at all, he will have done a service.

The illustrations are all first rate, and true to Nature. The old barn wall is one that many might copy on old walls with a similar charming effect.

We congratulate the author heartily on writing such a delightful book.

"Fruit Growing in Arid Regions." By Wendell Paddock and Oliver B. Whipple. 8vo., 395 pp. (Macmillan Co., New York and London, 1910.) 6*s*. 6*d*. net.

We have seldom read a more practical work than this, and though written for fruit growers in arid regions, there is a mass of information

of great value for fruit growers in this country. On the debatable question of pruning or not pruning the first year after planting, the authors are very emphatic in favour of pruning at once after planting. Abbreviated, this is what the authors say: "It is not generally realized that when a tree is taken from the nursery row, a large part of the root system is left in the ground. The balance between the roots and the top is thus destroyed, and obviously a part of the top should be removed. In transplanting, the nursery tree is often deprived of one half or more of its roots, and not only must it become established in the soil, but it must produce a large number of new roots before much new food can be supplied. In the meantime, the leaves begin to push out, and the reserve food and moisture may all be used before the root system is in a condition to supply more. By cutting back the tops and thus reducing the number of buds, this supply is conserved, and thus the tree is tided over the critical period until root hairs are formed. Is it any wonder, then, that the failure to cut back the tops of newly planted trees results in the death of many of them?" There is a great deal more excellent advice on the pruning of trees equally applicable in this country. There is a most interesting table showing how much plant food is removed from an apple orchard in twenty years, as compared with wheat over the same period, and proving how essential it is to manure much more heavily for fruit than for corn, and that scrupulously clean cultivation is not all there is in the handling of orchard land. Much of the information is, of course, unsuited to this country, but, on the other hand, there is much that ought to be read, marked, and learned.

"The Story of My Old-World Garden and how I made it in a London Suburb." By G. Hillyard Swinstead, R.I. 8vo., 51 pp. (Baines & Scarsbrook, London, 1910.) 10*s*. 6*d*.

This book is really a work of art, with fifty beautiful and original drawings, designs, and photographs, showing what may be done in a small space, the dimensions of the garden being only 55 by 45 feet. It is astonishing how much can be done, and how beautiful a garden can be made by a born gardener and artist in such a small area. Every page and every illustration is an object lesson that might well be copied on a larger scale, where space will permit of it being done. In these days when everyone is more or less keen on gardening subjects, this book will be attractive on the drawing-room table.

"Broad Lines in Science Teaching." Edited by F. Hodson, Ph.D., B.Sc., with an introduction by Professor M. E. Sadler, M.A., LL.D. 8vo., xxxvi. + 267. (Christophers, London, 1910.) 5*s*. net.

"The Teaching of Scientific Method, and Other Papers on Education." By Professor H. E. Armstrong, LL.D., Ph.D., F.R.S. Ed. 2. 8vo., xxvii. + 504 pp. (Macmillan, London, 1910.) 5*s*. net.

"The Teaching Botanist." By W. F. Ganong, Ph.D. Ed. II., 8vo., xi. + 439 pp. (Macmillan Co., New York and London, 1910.) **5s. net.**

The teaching of natural science is gradually assuming its true place in education. One phase of it, "Nature Study," is becoming more and more recognized as the true point of view for the education of the quite young in all grades of schools, and especially, perhaps, in the elementary school; the increase in Government-aided secondary schools has ensured the recognition of science as an important part of the curriculum; and now, gradually, the private schools are recognizing its importance, and, except for the exigencies of "scholarship" examinations, there is little doubt that it would gain ground quicker. Even at Eton, thanks in large measure to the exertions of Sir Henry Roscoe, some progress has been made, but we may echo his words: "The real educational value of science is not to get a smattering of so-called Nature-knowledge." . . . It "is not to know how a pump works or how to test for sulphuric acid. The value lies in the formation of an orderly, observant, and accurate habit of mind." *

The material for education is wide as the world; the choice of it lies with the teacher; any method that leads to the formation of an orderly, observant, accurate habit of mind is the right method.

Whether it be the "Renaissance of Wonder" as Theodore Watts Dunton calls it; or the triumph of science in so many human affairs; or the growth of huge close-dwelling communities which leads to a reaction towards the open-air; it is certain that more and more value is being attached to direct communion with Nature and a sympathetic appreciation of Nature's wonders. Along with this seeking to Nature is the strong feeling that school work should not be divorced from daily life. It should not be a thing apart imposed as an extra finish, but rather be woven into the common web to strengthen and stay it.

The first of the books mentioned above is a symposium, and the broad teaching on scientific lines for which it pleads traverses almost every subject that ordinarily finds its way into the school curriculum, and some that are not ordinarily there. The editor has got together a series of essays which are worth the careful reading and study of all teachers. Most of the essays are written in relation to secondary school education, but those dealing with "Nature Study" apply particularly to the education of younger children.

The second series of essays, with one exception the work of one writer, is already widely known, and the essays themselves, either singly or collectively, have had a profound influence in directing education along desirable lines. Possibly the author, who is a physicist, fails somewhat to realize the true value of "Nature Study," and tends to regard it as of æsthetic value alone, while those who have tried its value know how potent its *living* interest also is. But apart from this, "scientific method" is the text of the book, and many an illuminating suggestion teachers who have not yet read it will gain by

* *Life and Experiences of Sir H. E. Roscoe*, p. 255.

its perusal. The one exception mentioned above is a rather amusing Kiplingesque poem by M. Solomon on "the conservation of matter."

The present edition is almost similar to the first, but contains a new "introduction" containing an interesting retrospect of educational work during the past twenty-five years and two new essays.

In the third volume we have scientific method applied to the teaching of Botany. Though the title is the same, the book differs widely from the former edition, but its whole spirit is the same. The book is described by the author as a "book of ideals." And it is true the author sets up a high standard, but it is such a one as all teachers of botany by the scientific method would wish to aim at. But he also claims that it is "a practical book." And indeed it is, for methods find much place in it. It is a book every teacher of botany should read. It is intended for the teacher of botany as an organized subject of instruction, and not for the teacher of "Nature Study," and as such it is admirable.

"The Flowers and Gardens of Madeira." Painted by Ella Du Cane, described by Florence Du Cane. Sm. 4to., 150 pp. (Black, London, 1909.) 7*s.* 6*d.* net.

Prefaces to books on gardening generally begin nowadays with an apology "for adding yet another to the long list," &c., &c. Reviewers of these books almost invariably fall into line by referring to the recent mass of garden literature.

And no wonder. *Such* a mass! But it is not all literature, and when it is literature it is seldom gardening. In their "Flowers and Gardens of Japan," the Misses Du Cane gave us garden painting and garden literature at their very best. It was a beautiful and intensely interesting book. The subject was at once difficult and easy, for the gardens of Japan must be full of those subtleties which most appeal to the artist, and are most difficult to capture, and Japanese garden-lore is a wide and complicated subject.

"The Flowers and Gardens of Japan" was an excellent and a judicious book, neither tome nor mere chat and pretty pictures, and the same may be said of "The Flowers and Gardens of Madeira." The illustrations are extraordinarily good. The reproduction of the water-colour drawings is not quite so perfect as in the Japanese book, but still, though they have of necessity fallen far short of the originals, they stand high among illustrations of this class. If only one could forget the originals, the reproductions would score more heavily. As it is, they recall very vividly the scents and colour, the gorgeous masses of flower and foliage, the white walls, blue sea, brilliant sunshine—in fact, the whole thrilling atmosphere of the lovely island. Madeira gardens have not the strong characteristics of the gardens of Japan. In the smaller town gardens, plants in pots play a large part. The possibilities of this side of gardening are delightfully shown in the two illustrations, "Azaleas in a Portuguese Garden" and "Azaleas, Quinta Ilheros." The grouping is charming, and these two illustra-

tions alone make the book valuable as a lesson in the arrangement of pot plants. Compare this with the stodgy "groups" in many "conservatories," drawing-rooms, and stuffy flower-show tents. The larger villa gardens depend more for their charm on rampant sub-tropical luxuriance and colour, than on coherent premeditated design. For this reason Miss Florence Du Cane is to be congratulated upon having accomplished the somewhat difficult task of writing an interesting book on gardens, which, at first sight, offer nothing but natural luxuriance. But she succeeds in describing their beauty and making it interesting. She gives lists, readable lists, of the plants they contain, and she gives useful cultural details. The last chapter of the book deals with the history of the island.

All who have visited Madeira, if only for a few hours from a mail steamer, should certainly buy this book, and all who buy the book will certainly want to visit Madeira.

"Agricultural Bacteriology: Theoretical and Practical." By J. Percival, M.A., F.L.S. 8vo., x + 408 pp. (Duckworth, London, 1910.) 7*s*. 6*d*. net.

Of books dealing with bacteriology as applied to the problems of agriculture and horticulture there are few in the English language. Two or three of considerable merit written in America, and the excellent translation of Dr. Lafar's "Technical Mycology" by Mr. Chas. T. C. Salter, are practically the only ones available, and the last is almost too technical for any but the very advanced student. There are, of course, many dealing with bacteriological methods, and several dealing particularly with the bacteriology of dairying, but no others cover the wider field of soil bacteriology and the fermentation of manures, and so on.

Professor Percival has attempted to combine a book of instruction in bacteriological study with a text-book of bacteriology as applied t agriculture, and, we venture to think, not unsuccessfully.

The first part of the book deals with the form and life of bacteria and with methods of isolation and study. The action of enzymes and fermentation are then dealt with, and then the special bacteriology of the soil, nitrification, denitrification, the fixation of atmospheric nitrogen by the agency of bacteria, and the nature of the fermentations which take place during the "curing" of manure. From p. 232 to the end describes the part played by bacteria in the dairy, and this portion need not detain us further.

The directions for the experimental work are for the most part very clear and accurate, though we do not think the author is right in recommending an *acid* medium (p. 46) for the cultivation of bacteria; our own experience is in favour of a very slightly alkaline medium for general work, using as a rule an acid medium for the cultivation of fungi.

The chapters on soil bacteriology are very clearly written, and the practical application of the lessons to be learned from the knowledge

gained by the study of soil bacteriology is indicated in definite and clear terms. The author adopts a very sane and safe attitude on the question of soil inoculation and recognizes that, while it is possible that, in the future, bacteriology may show us the way to utilize in a greater degree the activities of nitrogen-fixing organisms, the time is not quite ripe for any great extension at present. It may be that in time the study of the bacteriology of the soil will lead to a revolution in soil husbandry, just as a similar study has in dairy work.

One or two points we should like to have seen dealt with in a book of this kind, of which we find no mention, and especially the connexion of bacteriology with haymaking, flax-retting, sewage purification and water purification. These are all matters intimately connected with special forms of agriculture concerning which we have now gained considerable knowledge, and we might plead for a fuller treatment of the question of preserving fruits and vegetables as being not remotely connected with horticulture.

"Geology." By J. W. Gregory, F.R.S. 8vo., 140 pp. (Dent, London, n.d.) 1*s*. net.

Like all Dent's scientific primers this excellent little book covers a wide field in an interesting and accurate manner and is written in simple language. Professor Gregory is in the first rank of geologists, and his authorship is sufficient guarantee that the fundamental truths of geology are clearly and definitely set out. He has produced a book useful alike to the young student and to the general reader.

"The Aims and Methods of Nature Study: a Guide for Teachers." By J. Rennie, with an Introduction by Professor J. A. Thomson. 8vo., xvi + 352 pp. (Clive, London, 1910.) 3*s*. 6*d*.

We are often asked to recommend a book on "Nature Study" to teachers, and generally shirk the task, for to get the best value from Nature Study the teacher must have gone to Nature himself and have got into close touch with one or other of her many sides. He must have learned how to question Nature and how to read the answers in what he sees.

The book under review, however, will, we are sure, stimulate its readers to use it as it is intended it should be used—as a guide; and a guide, too, which will be more of a finger-post than a demonstrator. It is a book full of suggestions worthy of consideration by every thoughtful teacher, and has been developed all through in the spirit in which Professor Arthur Thomson has written the Introduction, where he says, "We must not codify, rationalize, and examinify Nature Study too much. Grammar badly taught is very bad, but it does not spoil a life, whereas harshly severe Nature Study may dim the eyes for life. . . . What we wish is not information but inquisitiveness, not learning-up about things but thinking about things in presence of the things, not to teach scientific principles (an understanding of which comes later, if ever) but to develop the scientific mood which is as natural as breathing."

Dr. Rennie has followed this idea all through his book, and has been able to avoid the one serious pitfall that exists in it—that of unconsidered meandering, and has shown, on the other hand, how a unity of idea may be aimed at while using a multitude of diverse materials.

We heartily commend the book to all teachers who desire to introduce the Nature-study idea into their teaching.

"How to Teach Nature Study: a Practical Working Guide for Teachers." By T. W. Hoare, 8vo., xxii + 316 pp. (Sidgwick & Jackson, London, 1910.) 3*s*. 6*d*. net.

Much of this book trespasses out of the realm of Nature Study into that of experimental science and is thus suited for an older type of pupil than that for whom Nature Study is generally intended. There are some useful observational exercises in it, and suggestions as to what to look for in rambles near the school. The book, however, seems to lack cohesion in places, and the teacher will probably find it more useful for its hints on the making of aquaria, vivaria, and so on, and for directions as to the preparation of specimens, than for its other parts. The directions for the making of simple apparatus and for simple experiments are very clear as a rule, though where deductions are drawn from experiments the deductions should be amply justified. Children old enough to profit by the experimental method should always be taught to examine carefully into any inferences they may draw, and no slipshod methods of reasoning should be allowed. We think here and there the book might be improved if greater attention had been paid to this—as, for instance, at p. 158. Better one experiment thoroughly worked out and well understood than a multitude only imperfectly grasped.

We should also like to see fewer teleological explanations of plant structures than appear in the book.

After all, however, we can agree with all the author says as to Nature Study as a natural educational force; and we realize that not the matter but the method counts for most, and that not so much in the content of the course, but the intent of it, lies its value.

"Tillers of the Ground." By Marion I. Newbigin, D.Sc. 8vo., viii + 224 pp. (Macmillan, London, 1910.) 1*s*. 6*d*.

The aim of this little book, which is one of the "Readable Books in Natural Knowledge," is to show how progress in plant cultivation has developed from its early beginnings in far-back years of man's history and among primitive (and indolent) peoples of the present day to its highest developments under the most advanced civilization. The task has been achieved with success and a very readable and informing little book is the result, setting out some of the ways in which scientific work has assisted practical life in this direction and showing how promising is the outlook for the future if practice will take science as her handmaid and her guide.

"British Butterflies, Moths, and Beetles." By W. F. Kirby. 8vo., 96 pp. (Sonnenschein, London, 1905.) 1*s*.

A useful little book for the young naturalist, with many figures of common insects and directions for their collection and preservation. Like all the "Young Collector" series, this has no index.

"The Smuts of Australia—their Structure, Life History, Treatment and Classification." By D. McAlpine. 8vo., vii + 288 pp. (Kemp, Melbourne, 1910.) 4*s*.

Some little time ago Mr. McAlpine published a monograph on the rust fungi of Australia, and now he has increased our indebtedness by an excellent account of the smuts. The smut fungi are of great economic importance, especially in their relation to grain crops; but this present work is much more than an enumeration of the species that occur in Australia, for accounts of large numbers of experiments upon such important matters as parasitism and immunity and the relation between host and parasite are given, as well as a review of most of the previous work on the group, and of methods of practically dealing with the diseases induced by these fungi. It is illustrated by numerous figures and photomicrographs, and is a volume indispensable to all workers in the same field.

"Pansies, Violas and Violets." By William Cuthbertson, J.P. Edited by R. Hooper Pearson. 8vo., 116 pp. (Jack, London and Edinburgh, 1910.) 1*s*. 6*d*.

This is a useful addition to the many excellent works dealing with these greatly improved hardy flowering plants, although in several respects it reminds us of a book written by the same author some years ago.

The history, &c., of both subjects is carefully gone into, but hardly sufficient is said respecting the more recent work with Pansies and Violas. Raisers of to-day are largely responsible for the great improvement we see in varieties represented at the leading shows and largely grown in our gardens.

The subjects are dealt with in comprehensive fashion, and "Pansies and Violas from seed," "cultivation from cuttings," in which the most approved methods now adopted, as well as suggestions for "propagating out-of-doors," and "by division of the plants," are considered in turn.

The "cultivation for exhibition and other purposes," and the "staging" of exhibition blooms is fully gone into; but this aspect of the question appeals to only a limited number of persons.

For this reason we welcome "Violas for beddings," and regret that more space is not given to this interesting aspect, as the future of both Pansies and Violas is largely involved in what raisers and distributors do in this direction. Their use in table-decoration is an interesting item, and we should have liked this matter gone into more fully, so that it embraced other points of decoration which tend to show the uses to which these dainty flowers may be put.

"Raising new varieties" will appeal to many amateurs who desire to improve existing kinds, and the selection of the hardiest Violas will prove interesting to many.

The trial from which the selection of "the hardiest Violas" is culled would have been of greater value had it been dealt with in a more comprehensive manner and been conducted under the auspices of some public garden or other public authority. The results, however, are very satisfactory, and prove most conclusively the varieties that will do well in the hardy flower garden.

The selection of fifty varieties of "Fancy or Decorative Pansies" and "Fifty Varieties of Violas" embrace many of the very best kinds, but most of them are specially suitable for exhibition and for growing to obtain flowers for decorative uses.

A chapter is devoted to "The Sweet Violet" by the editor, and the subject is dealt with in a most satisfactory manner. Another chapter is given to the consideration of some of the principal species of the genus *Viola*.

A calendar of operations is a most useful adjunct.

The get-up of the book is distinctly attractive, coloured photographs representing Violas, Fancy Pansies, Violets, and three varieties of *Viola cornuta* in life-like character. Altogether the book is interesting, instructive, and useful to those who desire further information regarding these plants, and we doubt not it will appeal to all lovers of the hardy flower garden and to the amateur in particular.

"British Floral Art." By R. Forester Felton, F.R.H.S., F.Z.S., &c. 8vo., 194 pp. (Black, London, 1910.) 7*s*. 6*d*. net.

We welcome this new work, and as the author is so well known as an eminent authority on the subject, we naturally expected something quite out of the ordinary, and in this we are not disappointed. It is a most luxurious publication, and no pains seem to have been spared to make the contents of practical value to all who are interested in the development of floral art. There is a prefatory note by Sir Albert K. Rollit, Litt.D., D.L., &c., who speaks in the highest terms of the author's qualifications as a floral artist. There are twenty chapters dealing with special subjects, such as "Floral Decoration of the Home," and "The Rose," "Carnations," "The Chrysanthemum," "Orchids," "Tulips," and several other of the better-known popular flowers that lend themselves so admirably for decorations. A chapter on "Church Decoration," and another on "Children's Flower Shows," besides an invaluable chapter giving "A Few Useful Hints," cannot fail to prove of inestimable value to many lovers of flowers who wish to make the most of their garden and interest others in such praiseworthy efforts. Twelve photographic illustrations in colours, and no fewer than fourteen black and white illustrations, serve to portray a charming series of decorations both for public and private purposes. Especially noteworthy are the coloured photographs representing "A Bouquet of Madame Abel Chatenay Roses," made for H.M. the Queen when

Princess of Wales; "A Little Diplomatic Dinner table" of Roses, "Lady Gay," and "Ellen Terry"; "A Court Bouquet" of Orchids, made for Her Majesty Queen Alexandra; and the "Entrance-hall at Claridge's"; and "The Royal Box at Olympia Great International Horse Show, 1908." These and others, all superbly done, depict floral art of a high degree of excellence. Many of the black and white illustrations have much to interest private decorators who desire to make the most of the decorative material they may have in their own gardens and greenhouses.

In not a few instances they represent triumphs of the floral artist's skill. Such subjects as Baskets of Roses, Dinner-table Decorations, Floral Harp, Irish Harp, Fireplace Decorations, as well as decorations for windows, chancels, fonts, and others of a somewhat comprehensive character are depicted. We are in accord with Mr. Felton when he says, "Nature not only places abundantly at our disposal the flowers with which to carry out our schemes, but she surrounds and stimulates us with endless suggestions, which we should ever patiently study and faithfully follow." His advice when in doubt how to arrange the flowers deserves to be strongly emphasized. The author advises those in doubt "to ask themselves where and how the flowers with which they may be dealing originally grew; and, having settled the matter in their own minds, let them steadfastly endeavour to arrange them in as nearly similar positions as possible, always allowing themselves that artistic latitude which will enable them to adapt the flowers to their new surroundings." It is very encouraging to read that England need fear no rivals in respect of floral art, for "Each time I visit Paris, Berlin, Hamburg, or even great centres of flower-growing, such as Nice, Cannes, Grasse, and Monte Carlo, I find that we, as a people, are more than holding our own in the great and beautiful works of the floral world." Mr. Felton has many valuable suggestions to make under numerous headings, and they are very practical, and invaluable to those who desire to progress in floral art. In dealing with each subject in turn suitable flowers are mentioned, so that the reader may be able to determine quite easily the best kind to use for the subject he may be dealing with. Contrasts in this respect are also laid down for the guidance of the inexperienced, as well as flowers which make lovely decorations by themselves. There is a mass of information within the covers of this beautiful book, which is based upon a long practical experience in which the author has proved himself a "peer" among his fellows. It is brimful of excellent advice of the most reliable kind, and deserves to be widely read by all who are interested in promoting the development of British Floral Art.

"Hardy Plants for Cottage Gardens." By Helen R. Albee. 8vo., 309 pp. + plates. American Nature Series. (Holt, New York, 1910.) $1.60 net.

This is one of the copiously illustrated garden-books of the personal type, though the title is rather a misleading one to English people,

whose ideas of cottage gardens are apparently different from those of the authoress. The larger part of it is taken up with a description of the writer's garden, the trials she underwent in the acquisition of her horticultural knowledge, and the way in which she converted a rock-strewn New Hampshire wilderness into a beautiful garden. One has to look through more than the usual quantity of chaff to find a grain of wheat. Her lists of plants recommended on pages 60, 84, &c., would be more valuable if the plants were less vaguely described, many being indicated by the generic names only, while others are called by names which are either not generally known in this country or are variously applied in different localities—*e.g.* Johnny-jump-up, bouncing Bet, bachelor's buttons, boy love, baby's breath, &c. This is, however, atoned for to some extent by a good index.

The spelling or form of some of the names needs revision—e.g. *Tangetes* (p. 243) instead of *Tagetes*, *Phlox sublata* (pp. 171 and 213) instead of *P. subulata*, *Aster Nova-Belgii* (p. 223) instead of *A. novi-belgii*, *Weigelia* (pp. 72 and 85) instead of *Weigela*, *Oenothera fruiticosa* instead of *O. fruticosa*, *Aubretia Leichthinii* (p. 83) instead of *Aubrietia Leichtlinii*, *Lineria marrocana* (p. 61) instead of *Linaria maroccana*, and many others.

There are various descriptions of plants and cultural directions to which we take exception. At p. 181 the Spanish Iris is stated to be a still later variety than the English. At p. 103 the perennial phlox is classed with the Heleniums and Sunflowers as attaining an unruly height, and pinching is recommended. At p. 189 an unknowing reader is likely to be misled by the statement that *Lathyrus latifolius albus* has clusters of flowers and buds larger than the sweet pea; and the same objection applies to the advice on p. 102 to plant annuals and perennials thickly and relieve the congestion, if necessary, by picking off the lower leaves.

Nearly one-third of the book is composed of a list of shrubs and plants classified according to colour and month of flowering, with descriptive and cultural notes, and this is the only really useful part of the book. However, as the notes are written for the climate of one of the New England States, we doubt whether in this country the book will survive the struggle for existence among so many books catering for the same class.

"The Science and Practice of Manuring." By W. Dyke. Demy 12mo., 132 pp. (Lockwood Press, London, 1910.) Paper, 1*s*.

A very useful little book, alike for the beginner and the experienced, the information about manures and manuring being both elementary and comprehensive. Mr. John Wright, in a foreword, expresses "the opinion that not elsewhere is so much sound knowledge of the subjects treated to be found for a shilling."

"Teachers' Notes on Nature Study: Plants and Animals." Anon. 8vo., viii + 232 pp. (Blackie, London, 1910.) 1*s*. 6*d*. net.

This is issued "to suit the new ways of teaching an old subject." Whoever compiled it failed entirely to realize what Nature Study

means. It is merely a collection of notes for "object-lessons"—good, perhaps; but we have a better method, and the author knows nothing of it. The best that can be said about it is that it gives mostly accurate information about some common animals and plants.

"Alpine Plants at Home." 2nd series. By Somerville Hastings. 16mo., 72 pp. (Gowans & Gray, London, 1910.) 6*d*. net.

A series of excellent reproductions of photographs of July-flowering alpine plants, with brief notes on each. The pictures show the form and habit of each plant excellently.

"Journal of Genetics." Ed. by W. Bateson, M.A., F.R.S., and R. C. Punnett, M.A. 4to., 72 pp. (University Press, Cambridge, 1910.) 10*s*.

We welcome this Journal devoted to the newest branch of Biological Science. The experimental study of the laws of heredity by the analytical method is one that has made giant strides in this country since the discovery of Mendel's paper and the publication of an English translation in these pages (R.H.S. Journal, vol. xxvi. (1901), p. 1). The present part (four parts constitute a volume, the parts to be issued as matter accumulates) contains papers on "White-flowered Varieties of Primula sinensis," "Inheritance of Colour, &c., in the Potato," "Mode of Inheritance of Stature and of Time of Flowering in Peas," "Studies in the Inheritance of Doubleness in Flowers—Petunia," "Effects of One-sided Ovariotomy on Sex of Offspring."

We need not refer in detail to these, as abstracts of them are given in another place, but we cannot forbear to remark how further research is showing how complicated the whole question of unit-characters is, and how small and hidden they may be. From a practical point of view it would be almost impossible to breed a sufficient number of individuals to be able to isolate all the forms, but there remains always the rule which gives the greatest chance of success. "Sow seed of individuals separately and pick out that group, the offspring of one plant, to breed from in which all alike show the desired character." More confusing still is the fact that while in one kind of plant a certain character is dominant, in another an apparently similar character may be recessive.

Needless to say, the editing of this new Journal and its general "get-up" are admirable. The plates are specially worthy of commendation.

"Garden Foes." By T. W. Sanders, F.L.S. 8vo., 326 pp. (Collingridge, London, 1910.) 2*s*. 6*d*. net.

Many gardeners will find this compilation very useful. Most of the common insect pests and fungus diseases of garden plants are dealt with. Here and there, especially in dealing with fungi—*e.g.* the account of the history of the "club root" fungus (p. 189), the figure of *Septoria rosae* (p. 246)—one finds technical inaccuracies, and some pests are rather inadequately dealt with; but as the remedies sug-

gested are usually those commonly used, and are reliable so far as our knowledge at present goes, they may be depended upon. The red mites so common on apple trees are, in spite of the statement to the contrary (p. 61), looked upon by most competent observers as quite harmless, and, indeed, rather to be encouraged than destroyed. It is interesting to learn that the Narcissus fly may be trapped "in spring by placing saucers containing syrup or molasses among the plants"—it is very important to note that this pest is about in May, June, and well into July, and is, indeed, often abundant at the beginning of the last month. We shall hope to see many little points such as these rectified in a future edition.

"The Coming of Evolution." By Prof. J. W. Judd, F.R.S. 8vo., 171 pp. (University Press, Cambridge, 1910.) 1*s*. net.

This little volume is the first of a new series issued under the title "The Cambridge Manuals of Science and Literature." Its title amply indicates the subject, and its treatment could have been in no better hands. The story of the groping for the truth concerning the origin of species and the story of the recognition of evolution as a living force are told in a most instructive and interesting manner, and the reader is left in no doubt as to the great place Darwin must occupy in the world of thinkers. This little book is a noteworthy addition to the long list of books dealing with evolution.

"Battersea Park as a Centre for Nature Study." By Walter Johnson, F.G.S. Sm. 8vo., 128 pp. (Fisher Unwin, London, 1910.) 1*s*. net (paper covers).

Those who say there is no wild life to study in a town should get this little book. A brief history of Battersea and its park is given, but the bulk of the book deals with the natural history of the district, and notes on the more conspicuous of the animals and plants add to the interest of the lists which it contains.

"Diseases of Economic Plants." By F. L. Stevens, Ph.D., and J. G. Hall, M.A. 8vo., x + 513 pp. (Macmillan Company, New York, 1910.) 8*s*. 6*d*. net.

Though written for American growers, English gardeners will find this well-illustrated and clearly-written book of great use. Following instructions as to the making of fungicides, general notes on symptoms of disease and on methods of treatment, the most prevalent diseases of special plants are dealt with. One innovation we notice, viz. an attempt to coin distinctive popular names for various diseases, but it seems doubtful whether this essay is likely to be largely followed. "Anthracnose" has "caught on" in some quarters for a certain type of disease, but we doubt whether such terms as "septoriose," "cercosporose," "pseudomonose," "colletotrichose," and others akin will find favour among growers. Who knows but what the gloeosporiose of the rose will not soon have to be called the glomerellose of the rose, if this type of nomenclature be adopted? and who is the better for

calling the smut of oats caused by *Ustilago laevis* Ustilagose instead of "covered smut"? or "dry rot" of sweet potatos "Lasiodiplodiose"? However, not science, but popular usage must determine whether such names stand and come into the common tongue.

This innovation does not detract from the excellent advice given on the treatment of the diseases dealt with or the clear descriptions of the symptoms of disease, and here we have no room to enter a complaint. Naturally, the emphasis laid upon different diseases varies from what would be the case in our own country, but one-time local diseases are apt, by-and-by, in spite of legislation, and sometimes, perhaps, because of it, to become international; so we may welcome here a full treatment of diseases which are not yet greatly prevalent on this side of the Atlantic.

There is now no lack of good text-books on plant-diseases in English, and though we have not yet such a comprehensive one as the "Handbuch der Pflanzenkrankheiten" of Sorauer, yet the writings of Cooke, Massee, Duggar, W. G. Smith's translation of Tubeuf's book, and Ward's "Disease in Plants" give us reliable information regarding plant diseases due to fungi and their treatment, and the present adds another to the list.

"The First Principles of Heredity." By S. Herbert, M.Sc. 8vo., vii + 199 pp. (Black, London, 1910.) 5*s*. net.

In the preface we read: "I claim no originality for the contents of this book. Its purpose is to supply in a simple and yet scientific manner all that may be desirable for the average intelligence to know about Heredity, and related questions, without at the same time assuming any previous knowledge of the subject on the reader's part."

We have, within the past four or five years, reviewed a large number of books dealing with heredity in this Journal, and among them are at least two or three covering practically the same ground as is covered by the present one. This certainly gives a full outline of the various theories that have been brought forward to explain the facts of heredity, and of some of the facts that need explanation; but such sentences as "The order of the ontogenetic stages of the embryogenesis is due to the inherent forces in this structural arrangement of the germ-plasm" suggest that some of the book might have been made more "simple"—fortunately, there is a glossary. A considerable amount of space is devoted to the consideration of Mendelism, and though we read much about "dominance" and "allelomorphs," and so on, yet we find no mention of Mr. Hurst's suggestion of the true explanation of observed phenomena being due to "presence" or "absence" of determinants in the germ-plasm (see this JOURNAL, p. 24). In so recently published a book one would look for mention at least of such a suggestion as this, which to the ordinary intelligent person, is certainly more illuminating than the abstract conception of a "recessive character," which is a character of the individual due to lack of something else, not a character in itself such as the "dominant character" is.

"The Evolution and Function of Living Purposive Matter." By N. C. Macnamara, F.R.C.S. 8vo., 298 pp. (Kegan Paul, London, 1910.) 5*s*. net.

This book consists of two Parts; the first deals with the main subject of the work; the latter is an historical account of the action of cyllase, from prehistoric times, to "substantiate the conclusions" of the first Part.

The object of the work is to establish the fact that action excited in living protoplasm by the various modes of energy, is transmuted by certain of its elements into movements adapted to promote the well-being of the organism (Preface).

The whole contention of the work is concentrated in the words, "The purposive elements [of protoplasm] which direct their movements, undergo a corresponding evolution, and become developed into matter possessing instructive, and finally psychical, functions."

In illustrating his theory by animal structures, he speaks, *e.g.*, of the motion of cilia as due to "energy acting on the living matter of the cilia; we call such energy purposive." Again, he says, "Protoplasm contains somatic, germinal, and purposive elements."

"The theory which seems to us best adapted to explain the phenomena presented by living matter, assumes that it consists of a specific numerical and structural arrangement of elements, which act as a transformer of non-vital into biotic or *living energy*. . . . *Life*, therefore, is the *result of chemical and other modes of energy acting on a specific form of matter*" (p. 159). This appears to be quoted from Professor B. Moore (our italics).

The fundamental objection to all the above is this. No elements, as those of which protoplasm is composed, are alive (C, O, H, N, S, P, Fe); nor are any combinations of them, apart from the organic world, associated with life. A chemist cannot make protoplasm, though he can produce in his laboratory many organic substances, such as madder and certain sugars, &c. It is only living beings that can make it in their bodies out of non-living elements. These elements have no power *per se* to exhibit "purpose." It is the same with all physical forms of energy. They can act on matter, but they cannot *direct it*. Matter and Force make up the universe; both are lifeless. Purposiveness, therefore, does not reside in either matter or force; and neither, therefore, can evolve life *with* purposiveness. It is *Life* alone which is the *Director* of Forces, being endowed with a capacity to build up matter for a purposeful end.

"Phases of Evolution and Heredity." By D. H. Hart, M.D. 8vo., 259 pp. (Rebman, London, 1910.) 5*s*. net.

This book contains fourteen essays, with notes and glossary. The first deals with Darwin and Weismann, whom the author follows, and rejects the view that adaptations arise by response to the environment,

unless such can affect the reproductive structures and not the soma only. He says the Darwin-Wallace theory involves: (1) variation, (2) inheritance of it, (3) elimination of the less fit &c. by natural selection. No one disputes the first two; but Darwin never gave a case of his so-called "influencing" variations required for natural selection. On the other hand, later in life he recognized the possible needlessness of natural selection. The author next describes Mendelism, but makes a distinction between the *soma* and the *gametes*, and considers the terms "dominant" and "recessive" as misleading; but the reader must be referred to the book for his reasons.

Stress is laid on Biometry in considering variations; but the author overlooks the fact that no merely *numerical probabilities* can account for *adaptations with purpose* in variations. He advances his own theory, called *An Intrinsic Theory of Variation and Transmission*, by which he would apply biometry to the microscopical gametes, observing "the determinants of the unit-characters in [the primitive germ-cells] are arranged according to the Law of Probability." He next discusses De Vries' Mutation theory, and devotes two chapters or essays to Heredity. We then have two more, on Bees; on Evolution and Controversy; the Handicap of Sex; Evolution in Religion; and lastly, men who have revealed themselves.

"Wild Flowers of the British Isles." By H. Isabel Adams, F.L.S. Revised by James Bagnall, F.L.S. Vol. II. Large 8vo., 199 pp., 62 coloured plates. (Heinemann, London, 1910.) 30*s*. net.

On the title-page we read "completing the British wild flowers, with the exception of water-plants and trees." Why these are omitted (as we note *Hottonia* and *Acorus* are described) is not clear.

The flowers and dissections are very clear; but, as in Vol. I., it is unfortunate that the plants figured are so crowded; but this, we suppose, was inevitable; and when not crowded the space is filled with text.

"Fifty Years of Darwinism: Modern Aspects of Evolution; being Centennial Addresses in Honour of Charles Darwin, before the American Association for the Advancement of Science, Baltimore, January 1, 1909." 8vo., 274 pp. (Holt, New York; Bell, London, 1909.) 8*s*.

With the exception of the first, by Professor Poulton on "Fifty Years of Darwinism," all the addresses are by Americans. They deal with (in brief) "The Theory of Natural Selection from the Standpoint of Botany," "Isolation," "The Cell," "Direct Influence of Environment," "Unit Characters in Heredity," "Mutation," "Adaptation," "Darwin and Palæontology," "Evolution and Psychology."

Mr. Coulter, who writes the second, begins with the important recognition that Darwin's "historical position in plant physiology and in plant ecology is one of the first rank." He emphasizes the fact that "selection does not originate characters," and alludes to

Aster with its innumerable species with endless intergrades, and says, "Natural selection would seem to be an adequate explanation of the situation." Bentham long ago said there were no good characters for separating the ninety *genera* of the sub-tribes of *Asteroideae*. We should have thought this was an excellent case to prove the *non-existence* of natural selection, for every conceivable variety exists! Like *Hieracium*, it is evidently a genus of easy adaptation.

He says the botanist "cannot discover how it [Natural Selection] can really originate new characters." Of course it cannot. Darwin told us it only stands for a metaphor, and *per se* can *do* nothing. He is quite right in observing "the greatest difficulty with natural selection is adaptation." Ecology has quite upset the old ideas—*e.g.* that prickles were to ward off browsing animals. Such an *a priori*, assumed adaptation, is simply teleological; whereas we now know that plants automatically "respond" to the environment. One result being spines, under drought, and dissected submerged leaves under water.

Mr. MacDougal deals with this subject under the title "The Direct Influence of the Environment"; but he does not appear to be very familiar with the subject, for he says an arid atmosphere or intense insolation would affect leaves chiefly; while unusual soil concentrations would influence roots only. Desert plants would show the inadequacy of the first statement, and halophytes the second. He then considers experiments on the germ-cells in hens, and refers to many animals and plants which under experiments failed to show that the offspring were affected. The reason is obvious. In nature the hereditary traits originating as acquired characters were due to natural responses to external natural conditions; and then, *many* generations are mostly required to fix them. Mutilations, *e.g.*, are not "the direct action of the environment" nor the source of varietal characters.

Mr. Eigenmann also deals with "Adaptation" from the zoological point of view, but *inverts the process*. Thus, he says, "Fish selected the places adapted to each species. Blind cave fishes do not have degenerate eyes *because* they live in caves; but they live in caves because their ancestors were adjusted to do without the use of the eye." One naturally asks how did they find out where the caves were? The author is evidently not aware of de Viré's experiments on blind animals of caves (*Comptes Rendus*).

The other addresses mainly deal with zoology, so need not be here discussed. The volume is very interesting, but the authors appear to be unaware of the vast importance of ecology in interpreting nature.

"Hereditary Characters and their Modes of Transmission." By C. E. Walker, M.R.C.S., &c. 8vo., 239 pp. (Arnold, London, 1910.) 8*s.* 6*d.* net.

This book contains twelve chapters, Bibliography, and Index. They deal with—"The Structure of Living Matter"; "The Cell in Animals and Plants: its Structure, Division and Differentiation"; "Variation, Mutation"; "Adaption"; "Inborn Characters"; "Causes

of Variation" ; "Environment and Acquired Characters" ; "Mendel's Discovery" ; "Sex" ; "General Considerations." A large amount of subsidiary matter is discussed under each of the above headings. Not only does the author endeavour to account for heredity by means of the cellular machinery, but gives the various theories of others. They are too speculative at present to be considered settled.

The whole of the book is unfortunately marred by the author taking no account of Darwin's alternative explanation of the origin of species *without the aid of natural selection*. In the list of works, he only gives the *Origin* &c 1859. He has evidently not studied the sixth edition. Consequently, the author regards natural selection as always necessary and all-sufficient; whereas Darwin says that when "definite results occur, natural selection is absent." *

He refers all characters, hereditary or otherwise, as being "inborn." Of course the former are so; but if "acquired," and they reappear in the offspring, they are due, he says, to "modifications of [hereditary?] inborn characters"; but this does not seem to account for the *first* appearance of a *new* character, when the parent did not possess any inborn character which could be modified so as to reproduce it. For example, the Virginia Creeper (*Ampelopsis hederacea*) forms adhesive pads on the tips of its tendrils, but *only after* contact with a wall. It has *no* inborn characters to produce them spontaneously; but its ally, *A. Veitchii*, begins to develop them *before* any contact is made at all. This seems to imply a totally *new*, inborn character. But according to Weismann and the author, such an hereditary character requires an already inborn character to be affected by the direct action of the environment. As an illustration he takes what he calls "the classical example of a scar on a nose." But scars and mutilations are not *varietal* characters, and have nothing to do with the origin of species, because they are not results of a *response to the environments* which Darwin recognized as the sole source of variations.

It is not sufficiently emphasized by the author and other writers that when variations are discussed there is a great deal more than the mere external forms of organs; for organs are made of tissues of various cell-structures; their changes have to be accounted for. New cells assume new shapes and uses. Hence the origin of variations must be traced to the *nucleus*. Many researches are now being made to try and discover the cell-machinery in which lies the potentiality of heredity, as well as the vehicle of new adaptations with acquired characters. Many theories are propounded. If the reader is interested in these speculations he must refer to this and other books. It is, however, unfortunate that so many of this class are written by zoologists, for plants are so much easier to study and to be used for experiments. The authors know next to nothing of the incontrovertible truths established by ecologists.

* *Animals and Plants under Domestication*, ii. p. 271, &c.; *Origin* &c., 6th ed. pp. 6, 72, 80, &c.

"The Development of British Forestry." By A. C. Forbes, F.H.A.S. 8vo., 274 pp. (Arnold, London, 1910.) 10*s.* 6*d.* net.

So many of our works on forestry savour of Continental systems and practices that it is refreshing to hear what a mature, practical forester like Mr. Forbes has to say on the subject of British forestry and its development. The book is, perhaps, not so much one for the amateur forester as for those of more mature years and views, and who have made a life-long study of forestry in this country and know what our wants are in the matter of timber production and how best they can be supplied. The book is divided into nine chapters, extending to nearly three hundred pages, every one of which is crammed with well-thought-out opinions regarding what forestry is at present and what it should be in order to partly meet the ever-increasing wants of our country in the matter of timber production—in fact, the whole problem of afforestation is carefully considered and reviewed at considerable length and in a masterly manner. We have reviewed many works dealing with matters pertaining to forestry, but rarely one that has a more practical ring about it than that under consideration, and certainly Mr. Forbes is to be congratulated on producing a book that is sure to win favour from everyone who is at all interested in the development of British forestry.

"Plant Anatomy." By W. C. Stevens. Ed. 2. xv + 379 pp. (Churchill, London, 1910.) 10*s.* 6*d.* net.

We have already reviewed the first edition of this work (vol. xxxiv. p. 103). The praise we were able to bestow upon it is equally merited by the present edition, where the author has added an excellent chapter on "Reproduction." One or two of the figures in which attempts have been made to render the results of breeding evident are not altogether a success, perhaps, but the matter is clear and accurate. Little change is evident in the rest of the book, though there are a few in the chapters dealing with micro-technique. The whole has been reset.

"Plant Animals, a Study in Symbiosis." By Dr. F. Keeble. 8vo., viii + 163 pp. (University Press, Cambridge, 1910.) 1*s.* net.

In his "African Game Trails," Theodore Roosevelt says, "I did not often take scientific books, simply because as yet scientific books rarely have literary value." We think, however, that most will find *this* "as interesting to read as any other good book." Dr. Keeble deals with a most interesting phase of the interdependence of different living organisms, symbiosis, and in such a way that one is loth to leave the book. This, however, while the central point of the book, is not the only important one dealt with, for the account of his observations of the minute worms he has watched and experimented with is full of matter of importance, scientifically, and of interest to all intelligent people.

"A Lecture on Mendelism." By H. Drinkwater, M.D. 8vo., 31 pp. (Dent, London, 1910.) 2*s*. 6*d*. net.

This lecture was delivered at Leicester, and gives a simple outline of some of the phenomena of heredity comprised under the title "Mendelism." It does not pretend to add any new matter, nor to throw any new light upon old facts, nor indeed to present old facts in any new manner.

"Heredity in the Light of Recent Research." By L. Doncaster, M.A. 8vo., x + 140 pp. (University Press, Cambridge, 1910.) 1*s*. net.

This little book, one of the "Cambridge Manuals of Science," while it adds nothing new to our knowledge of heredity, gives a plain and straightforward account of the present state of our knowledge in a readable form and at a price that renders it accessible to everyone. Such subjects as the "Cause of Variation," "Statistical Study of Variation," "Mendelian Heredity," "Some Disputed Questions," "Heredity in Man," are dealt with, and dealt with so as to give a clear conception of their importance. We can commend the book to any who desire a short and reliable summary of the present state of our knowledge of the principles of heredity.

"Daffodils." By Rev. Joseph Jacob. 8vo., 115 pp. (Jack, London, 1910.) 1*s*. 6*d*. net.

There is a mass of information in this work of Mr. Jacob's that will prove interesting and instructive to the daffodil lover, and even expert growers may glean a fund of serviceable knowledge from this well-printed and beautifully illustrated book. It is divided into sixteen chapters, under the following heads, viz.: "The Daffodil in Books," "History," "Botany and Physiology," "Cultivation," "Changing Bulbs from one Garden to another," "Propagation," "Raising New Varieties by Cross-breeding," "Enemies, Diseases, and Poisons," "Classification," "R.H.S. Classifications," "Varieties Illustrated," "Lists for Different Purposes," "Daffodils Exhibited on March 8 and 9, 1910," "Daffodil Shows," "Calendar of Operations," &c. The author has included practically all one could reasonably want to know. Some may not agree with the classifications; but, owing to hybridizing having been so great of late years, it is probably as good as could be compiled. An excellent Preface has been written by the Rev. W. Wilks, M.A., an old and enthusiastic grower of daffodils. Mr. Wilks believes that the present high prices of daffodils will not continue, and that better varieties than are now in commerce are not wanted. Some of the new varieties raised of late years are of poor constitution, as though hybridizing were being overdone.

"Root and Stem Vegetables." By Alexander Dean. 8vo., 114 pp. (Jack, London, 1910.) 1*s*. 6*d*. net.

From such a well-known authority as Mr. A. Dean we expect something good, and in this book our expectations are realized to the full.

as he deals with his subject in a masterly style. We are glad to see the author calling attention to the less-known vegetables, such as *Tropaeolum tuberosum*, *Stachys tuberifera*, celeriac, &c. If we were not so conservative we feel sure these vegetables would soon become popular, as most of them are delicious and afford a welcome change on the table. The work is not strictly confined to the subjects under the title, and many extremely useful instructions are given on the cultivation of vegetables, exhibiting, mushrooms, &c. The book is boldly printed and excellently illustrated.

"Garden Planning and Planting." By H. H. Thomas. Crown 8vo., 150 pp. (Cassell, London, 1910.) 1*s*. net; cloth, 1*s*. 6*d*. net.

This is another of those manuals so useful for the amateur published by Messrs. Cassell. The chapters deal with the making of all sizes and shapes of gardens, the designs for beds, their planting, hints on colour and rock, wall, and water gardens. The book is well printed and profusely illustrated.

"The Flower Garden." By F. J. Cole. Crown 8vo., 138 pp. (Dent, London, 1910.) 1*s*. net.

The volume before us is one of the Country Cottage Series, and admirably adapted for owners of small gardens, and contains a great deal of information of considerable value for such. In the next edition we would suggest an index, as this would increase the usefulness of the book.

"Syon House Trees and Shrubs." By A. Bruce Jackson. Crown 8vo., 38 pp. (West, Newman, London, 1910.) For private distribution only.

Anyone interested in trees and shrubs will find much of value in this little book. The names are in alphabetical order, and the botanical and common names as well as the natural order are given, also the height and time of introduction. In an excellent Preface the author gives an interesting history of Syon House and the grounds, mentioning that it affords one of the earliest instances of a collection of trees and shrubs in England. In Loudon's great work, "Arboretum et Fruticetum Britannicum," published over seventy years ago, Syon is frequently mentioned as the locality for rare interesting trees. Some of the trees are still very rare, others are unique for their size, and unfortunately some are on the downward grade. In future this book will, no doubt, be still more valuable than it is now, and Mr. Bruce Jackson deserves great credit for compiling such a very interesting list.

"Pot-Pourri from a Surrey Garden." By Mrs. C. W. Earle. 8vo., 366 pp. (Nelson, London, 1910.) 1*s*. net.

This book is so widely and deservedly known already that a review is quite unnecessary. The present volume is a cheap edition. We know of no other book giving so much varied and valuable informa-

tion for such a small price as this, and written withal in so pleasant a fashion. The low price of the book will bring it within reach of everyone, and we heartily commend it to those who have not read it.

"Making Horticulture Pay." Compiled and edited by M. G. Kains. 8vo., 276 pp. (Orange Judd Company, New York; Kegan Paul, London, 1909.) 7*s*. 6*d*.

A book specially written for American readers, and for them full of practical advice; but the greater portion of the matter is not of much value in this country.

"Rock and Alpine Gardening." By H. Hemsley. 93 pp. Second Edition. (Simpkin, Marshall, London, 1910.) 1*s*. net.

We have already reviewed the first edition of this book (vol. xxxiii. p. 548). In the second edition before us is added the Water-Garden, which is equally as well treated as the other portions of the book.

"Dry Farming: its Principles and Practice." By William Macdonald. 8vo., 290 pp. (T. Werner Laurie, London, 1909.) 6*s*. net.

Although this book was written chiefly for American readers, it contains so much extremely valuable matter relating to the cultivation and management of land applicable to almost every country, wet or dry, that we have no hesitation in recommending it. For instance, what splendid advice for cultivation of all kinds of land is the following, on page 56: "The most common and fatal error in Western farming is the careless preparation of the ground. Poor, shallow ploughing and the lack of after-cultivation of the soil are the two factors to which crop failure is mainly due. It is impossible for any plant to withstand a severe drought when its roots lie in hard, dry soil. But put the same seed in deep, mellow earth, with a moisture-saving mantle, and it remains green after weeks of rainless weather." There is no question that a mantle of loose surface soil is one of the best possible preventives of evaporation, on both heavy and light land, as proved by the excellent crops produced where this system is practised. Again, the author points out the necessity of deep cultivation and the breaking up of the hard pan caused by ploughing to one depth annually. This allows the capillary moisture to ascend from below and permits the roots not only to penetrate deeper, but to get the advantage of the ascending moisture. Many data are given, obtained from farmers and experiment-station workers, proving the writer's statements, and although some of the matter is not of much value to farmers and gardeners in Britain, there is very much that should be read and taken to heart here in other parts of the book. There is no index, the work being in descriptive chapters.

"Town Planting, and the Trees, Shrubs, and Herbaceous Plants that are best adapted for Resisting Smoke." By A. D. Webster. 8vo., 211 pp. (Routledge, London, 1910.) 3*s*. 6*d*. net.

Mr. Webster is eminently qualified to write on this important subject; his great experience in and around London has given him such

knowledge as very few men possess, and his book will be read by town and suburban residents with more than ordinary interest. It would be a good thing to ascertain if the London Plane (*Platanus orientalis acerifolia*) really causes throat and lung troubles; it seems that the danger is not imaginary, from the notes by Lord Walsingham and Dr. Henry in the *Times* and Mr. Webster's own observations. There are so many London Planes grown all over the kingdom, not only in towns, but in villages and about private dwellings, that in the interest of public health such a serious matter ought to be cleared up. It is often stated that no other tree will thrive like the London Plane in smoky, impure districts. Mr. Webster clearly proves that several varieties of the poplar will succeed equally well, if not better than the Plane, and our experience is perfectly in agreement with Mr. Webster's. The author puts the Plane first amongst forest trees for town planting, probably because of its handsome foliage and ornamental trunks; but until this question of its being dangerous or otherwise is settled we should advise the non-planting of planes. We are glad to see Mr. Webster condemns the planting of evergreen conifers in smoky districts; and the sooner the many miserable examples one sees about our towns are burnt and replaced with trees or shrubs that are really ornamental, and of which Mr. Webster gives ample choice, the better. The comprehensive list of herbaceous and rock-plants that will thrive in towns is excellent; and here again we can confirm all the author says on the plants he recommends. The book is clearly printed, nicely illustrated, and provided with a capital index.

"Fairy Plants: a Fern-book for Children." By F. G. Heath. 8vo., xv + 236 pp. (Ouseley, London. [1910.]) 2*s*. net.

Mr. Heath is a well-known writer on ferns, and now he has added to his many efforts in fostering a love for these plants by writing a book for children. All our native ferns are dealt with, and he has a word or two to say concerning some of the many variations in them met with from time to time. Their structure and life-story are simply described, and numerous small woodcuts assist in illustrating the text. The book will no doubt be read with pleasure by those who desire a simple and easy account of these beautiful plants.

"A Text-book of General Bacteriology." By W. D. Frost and E. F. McCampbell. 8vo., xvii + 340 pp. (Macmillan Co., New York.) 7*s*. net.

A few years ago bacteriology was a subject entirely within the realm of the specialist; now all students of natural history and applied biology must make themselves acquainted with its principles; and we know that bacteria and their work are intimately connected with our every-day existence. The authors have produced a text-book which will be welcomed by the student who wishes to gain a general and accurate knowledge of the structure and physiology of these organisms and their connexion with human health and industry.

"Fossil Plants: for Students of Botany and Geology." By A. C. Seward, M.A., F.R.S., Professor of Botany in the University of Cambridge. Vol. I., demy 8vo., 452 pp., 112 illustrations. Vol. II., demy 8vo., 624 pp. and 265 illustrations. (University Press, Cambridge, 1898 and 1910.) 10*s.* and 15*s.* net.

Fossil Botany has made great strides since 1898, when Professor Seward published vol. i. of his book and expressed his intention to complete the work by the issue of a second volume. Pressure of other work delayed the appearance of the second volume, but the delay can hardly be called a misfortune for Professor Seward, since, if the work had been completed within two or three years of the publication of vol. i., most of the matter of vol. ii. would now be out of date. Recent work on fossil plants has not only added to the number of types known, but it has also altered our whole conception of the floras of past ages. The Carboniferous Period, for example, is no longer the golden age of the Cryptogams and nothing more: it is also the age of Pteridosperms, and we begin to see foreshadowed the rise of the higher flowering plants.

Professor Seward has therefore found it necessary to extend his original scheme in order that the various groups of fossil plants shall receive equality of treatment. He has consequently reserved for a third volume his account of the Fossil Gymnosperms and Angiosperms. The Pteridosperms are commenced in vol. ii., but will be treated more fully in vol. iii., which will also contain "some account of the neglected subject of the geographical distribution of plants at different stages of the history of the earth." The subject of "distribution," as Mr. Pickwick would say, "comprises by itself a difficult study of no inconsiderable magnitude." We shall therefore not be surprised, and certainly not be disappointed, if Professor Seward still further extends his scheme, so that, ultimately, there are four volumes instead of two.

It is expected that any work which finds a place in the Cambridge Biological Series will be full, accurate, and well written. Professor Seward's work is well worthy of a place in the series. There is room for a really full standard work on fossil plants, such as this will be. Miss Stopes' "Ancient Plants" is, of course, a small "semi-popular" volume, and Dr. Scott's "Studies" were not intended to cover the whole of the ground. The present work, when completed, will give a fairly full account of every group of fossil plants known.

Part i. of vol. i. contains an historical survey of the progress of the subject and chapters giving such geological facts as are necessary to botanists who have had little systematic geological training. No attempt, however, is made to deal with the elements of botany for the benefit of geological students. Perhaps this is wise, since an appreciation of fossil botany is only possible to those who have a practical, if elementary, acquaintance with the anatomy of plants, and this can only be obtained in the laboratory. The groups treated in vol. i. are the Thallophyta, the Bryophyta, and (of the Pteridophyta) the groups Equisetales and Sphenophyllales. Vol. ii. begins with

additions and modifications to the account of the Sphenophyllales. The bearing of recent work (on *Psilotum* and *Tmesipteris*) on the supposed connexion between Sphenophyllaceae and Psilotaceae is fully discussed. Incidentally, the "genus" (?) *Psilophyton* is discussed, and the author suggests that probably the various forms now grouped under this name will be found later to belong to various genera, and even to different phyla.

The greater part of vol. ii. is devoted to Lycopodiales and Filicales. The Pteridosperms are reached on p. 485, but will receive more attention in vol. iii. An interesting feature of the book is that a brief survey is given of the existing plants of any group before the fossil plants of the group are described. This will be specially useful to students of geology, while students of botany, who should be familiar with the matter of these surveys, will welcome them none the less, since the arrangement makes comparison easy.

We are glad to see that, in his discussion of morphological problems, the author protests strongly against the formal attitude of mind which causes so many writers to try to fit every plant *organ* into an artificial scheme of plant *members*. It is by no means necessary that a sporangiophore should be labelled "shoot," "leaf," or "sterile frond," or that an "underground organ" of a fossil plant should be described in terms ("root," "rhizome," &c.) which have been the result of comparative study of recent plants only. Professor Seward says (and we cordially agree) that "discussions of this kind (on the nature of the sporangiophore) tend to assume an exaggerated importance, and frequently carry with them the implication that every appendage of the nature of a sporangiophore can be labelled either 'shoot' or 'leaf.' We treat the question from an academic standpoint, and run a risk of ignoring the fact that the conception of stem and leaf is based on morphological characteristics, which have been evolved as the result of gradual differentiation of parts of one originally homogeneous whole."

The illustrations are very useful and clear. In some cases the practice of showing only the small part of the object in a sketch makes the drawings less artistic than they might be, but in these cases the illustrations are what they profess to be—namely, illustrative sketches in which artistic finish is subordinate to morphological accuracy and perfect clearness. There are some good photomicrographs and a full list of authorities.

"Morphology of Gymnosperms." By J. M. Coulter, Ph.D., and C. J. Chamberlain, Ph.D. 8vo., 458 pp. (University Press, Cambridge, 1910.) 16*s*. net.

This is a valuable work, and must be studied by all interested in the minute structure of gymnosperms. It deals very fully with the latest researches, not only of the authors, but others; and covers the ground, as far as is known at present, of fossil as well as living members of the group. It is beautifully illustrated, and contains an ample bibliography and index.

EARLY-FLOWERING CHRYSANTHEMUMS AT WISLEY, 1910.

THREE HUNDRED AND FIFTY-FOUR stocks of Chrysanthemums were received and grown for trial. Cuttings were struck in the spring, and after being grown on in cold frames the collection was planted out in good soil, three feet being allowed between the plants. All made excellent growth, but a few varieties can scarcely be termed "summer-flowering," being in bud only on November 5, when five degrees of frost spoiled the display. The value of these plants can scarcely be over-estimated for the private garden, as they will produce an abundance of bloom from July until cut down by frost. The collection was examined by the Floral Committee on three occasions.

A.M. = Award of Merit.

VARIETIES.

*1. Abercorn Beauty.
2. Ada.
3. Agnes.
4. Baronne G. C. de Briailles.
5. Blue Boy.
6. Bobbie.
7. Bouquet Rose.
8. Bronze Prince.
9. Carmelite.
10. Carrie.
11. Champ de Neige.
12. Champ d'Or.
13. Crimson Marie Masse.
14. Crimson Queen.
15. Diana.
16. Eden.
17. Edith Syratt.
18. Elstob Yellow.
19. Emily.
20. Ernest Baltet.
21. Ethel.
22. Evelyn.
23. Fée Parisienne.
24. Firefly.
25. Fleuve Rouge.
26. Frankie.
27. G. Boucharlot (Improved).
28. Geo. Bowness.
29. Goacher's Crimson.
30. Goacher's Pride.
31. Harrie.
32. Hermine.
33. Hetty.
34. Holmes' White.
35. Horace Martin.
36. Improved Masse.
37. Jenny.
38. Jimmie.
39. Juliette.
40. Kuroki.
41. Le Pactole.
42. Leslie.
43. Lillie.
44. Mme. Marie Masse.
45. Maggie.
46. Market White.
47. Merstham Bronze.
48. Merstham Pink.

* All trials in the Wisley Garden are carried out under numbers only until judging is completed. The number prefixed to the name of the variety in the Report corresponds with that by which alone the variety was known until judgment had been given. Fellows visiting the Garden and noticing any plant under a number can easily ascertain its name later by reference to the Report in the JOURNAL.

49. Mignon.
50. Miss Balfour Melville.
51. Miss B. Miller.
52. Miss Martin.
53. Monsieur G. Grünerwald.
54. Mrs. A. Thomson.
55. Mrs. J. R. Pitcher.
56. Mrs. J. W. Scott.
57. Mrs. Willis.
58. Mrs. W. Sydenham.
59. Mytchett Pink.
60. Nina Blick.
61. Nina Williams.
62. October Gold.
63. Orange.
64. Parisiana.
65. Perfection.
66. Perle Rose.
67. Pink Bedder.
68. Polly.
69. Provence.
70. Robbie Burns.
71. Ralph Curtis.
72. Roi des Blancs.
73. Roi des Précoces.
74. Rosie.
75. Sally.
76. Tapis de Neige.
77. The Sparkler.
78. Tonkin.
79. Tottie.
80. Tuckswood Early.
81. Wells' Scarlet.
82. White Mme. Masse.
83. White Quintus.
84. Abercorn Beauty.
85. Acajou.
86. Acme.
87. Agnes.
88. Albert Rose.
89. Aquitaine.
90. Beacon.
91. Blue Boy.
92. Border Beauty.
93. Bouquet Rose.
94. Caledonia.
95. Carrie.
96. Cecil Wells.
97. Chaldon.
98. Champagne.
99. Champ d'Or.
100. Charles Schwarz.
101. Charming.
102. Château des Radrets.
103. Captivation.
104. Chatillon.
105. Chrysie.
106. Clara.
107. Comtesse de Cariel.
108. Connie.
109. Coral Queen.
110. Crimson Diana.
111. Crimson Queen.
112. C. A. de Witt.
113. Diadem.
114. Diane (Nonin).
115. Dolly Prince.
116. Dorothy Humphrey.
117. Derbyshire Crimson.
118. Eden.
119. Edith Syratt.
120. Edith Wright.
121. Edmond Duval.
122. Elaine.
123. Emily.
124. E. Mathieu.
125. Ethel.
126. Ethel Blades.
127. Evelyn.
128. Fée Japonaise.
129. Fire Dragon.
130. J. H. Runchmer.
131. Firefly.
132. Firelight.
133. Flame.
134. Freedom.
135. Gatton.
136. Geisha.
137. George Bowness.
138. General Hawkes.
139. Gertie.
140. Goacher's Crimson.
141. Harrie.
142. Hermine.
143. Holmes' White.
144. Improved Masse.
145. Ivy Stark.
146. Janie Brown.

147. Jenny.
148. Jessie Wallace.
149. Jules Mary.
150. Keith.
151. Lady Mary Hope.
152. Le Cygne.
153. Lena.
154. Le Pactole.
155. Leonard Peto.
156. Leslie.
157. Lillie.
158. Lizzie Adcock.
159. Lorraine.
160. Lyon.
161. Mabel.
162. Mabel Roberts.
163. Mlle. Aug. Dorey.
164. Madge Blick.
165. Maggie.
166. Marvel.
167. Maggie Boyes.
168. Maxim.
169. Medusa.
170. Mignon.
171. Mignon (Nonin).
172. Miss Balfour Melville.
173. Miss B. Miller.
174. Miss Davis.
175. Mr. J. Hording.
176. Mrs. A. Cookson.
177. Mrs. A. Thomson.
178. Mrs. A. Willis.
179. Mrs. Baird.
180. Mrs. Cullingford.
181. Mrs. Tom White.
182. Mrs. Cookson.
183. Mrs. W. A. Hobbs.
184. Monsieur G. Grünerwald.
185. Murillo.
186. Mychett Beauty.
187. Mychett Pet.
188. Mychett White.
189. Nina Blick.
190. Nippon.
191. Normandie.
192. October Gold.
193. O. J. Quintus.
194. Onward.
195. Oubanghi.
196. Ouragon.
197. Parisiana.
198. Paul Valade.
199. Perfection.
200. Perle Chatillonaise.
201. Perle Rose.
202. Pink Bedder.
203. Pride of Hayes.
204. Pride of Keston.
205. Pride of Merstham.
206. Primevère.
207. Princess Eva.
208. Provence.
209. Robbie Burns.
210. Rabelais.
211. Ralph Curtis.
212. Roderic.
213. Rodney Stone.
214. Roi des Blancs.
215. Roi des Violets.
216. Roi des Jaunes.
217. Roi des Précoces.
218. R. Pemberton.
219. Rosie.
220. Ryecroft Beauty.
221. Snowstorm.
222. St. Mary.
223. Sir Herbert.
224. Tapis de Neige.
225. Tapis d'Or.
226. T. Bannister.
227. Terra Cotta.
228. The Sparkler.
229. Tom Thumb.
230. Triumphant.
231. Venise.
232. Vésuve.
233. Walton Bradbury
234. Weald.
235. Wells' Masse.
236. Wells' Primrose.
237. White Masse.
238. White Point.
239. White Quintus.
240. Bretagne.
241. Unnamed.
242. ,,
243. ,,
244. ,,

245. Unnamed.
246. ,,
247. ,,
248. Alice Butcher.
249. Bronze B. Briele.
250. Bronze Martinmas.
251. Canarie.
252. Early Blush.
253. Flora.
254. Fred Pele.
255. Gentillesse.
256. La Luxembourg.
257. La Vierge.
258. Mme. Jolivart.
259. Martinmas.
260. Mr. Selby.
261. Mrs. Cullingford.
262. Nanum.
263. Précocité.
264. Toreador.
265. White St. Crouts.
266. Alice Butcher.
267. Anastasia.
268. Anastasia.
269. Bronze Blushing Bride.
270. Bronze Martinmas.
271. Flora.
272. Fred Pele.
273. Gentillesse.
274. La Vierge.
275. Martinmas.
276. Mr. Selby.
277. Mrs. Cullingford.
278. Nanum.
279. Piercy's Seedling.
280. Blush Star.
281. China.
282. Daisy Bell.
283. Eric.
284. Eva Grantham.
285. Formidable.
286. Florence Gillham.
287. Hilda's Favourite.
288. Kathleen.
289. Kitty Riches.
290. Pretty Polly.
291. Spitfire.
292. Wells' Pride.
293. Ada Nice.
294. Beauty.
295. Belle of Weybridge.
296. Black Prince.
297. Blush Star.
298. Bound's Favourite.
299. Brightness.
300. Bronze Pagram.
301. Carrie Luxford.
302. Cecil.
303. Clarice.
304. Cornfield.
305. Daisy Bell.
306. Dean Swift.
307. Dr. Ingram.
308. Dolly.
309. Dora.
310. Edith Pagram.
311. Eric.
312. Eva Grantham.
313. Evelyn Neale.
314. Fanny Murrell.
315. Florence Gillham.
316. Florrie.
317. French Marigold.
318. F. W. Smith.
319. Gem of Merstham.
320. Gracie.
321. Good Hope.
322. Honeysuckle.
323. Hilda's Favourite.
324. Jeannette.
325. Juno.
326. Kitty Graham.
327. Lily Ovenden.
328. Majestic.
329. Majesticus.
330. Mary Anderson.
331. Marie Corelli.
332. Merstham Glory.
333. Mrs. C. Curtis.
334. Mrs. C. Curtis.
335. Miss Rose.
336. Mrs. Earle.
337. Monarch.
338. Nellie Riding.
339. Pathfinder.
340. Olive.
341. Philadelphia.
342. Pink Beauty

343. Prince.
344. Prolific.
345. Purple Prince.
346. Queen Auratia.
347. Reine des Roses.
348. Sunset.
349. Robert Johnson.
350. Terpsichore.
351. The Downs.
352. The Navy.
353. The Veldt.
354. Yallergal.

1, 84. Abercorn Beauty (Dobbie), **A.M.** September 15, 1910.—Deep bronze; flowers large, very freely produced; height 2½ feet; a sport from 'Polly'; September.

85. Acajou (Wells).—Deep crimson; flowers medium; habit vigorous, and very free-flowering; 4 feet; end October to November.

86. Acme (Lowe).—Lilac-rose; single; vigorous habit; 3 feet; flowers large; end of October.

2. Ada (Dobbie).—Salmon-pink with gold tips; flowers medium; 2½ feet; early September.

293. Ada Nice (Wells).—Bright yellow; flowers medium, freely produced; 2 feet; September.

3, 87. Agnes (Dobbie).—Salmon-bronze; flowers large; 2½ feet; free-flowering; mid-September.

88. Albert Rose (Wells).—White tinged with rosy-violet; flowers medium; 2 feet; September.

248, 266. Alice Butcher (Dobbie).—Bronzy-red pompon; 2½ feet; free-flowering; October.

267, 268. Anastasia (Wells).—Rosy-pink pompon; 2 feet.

89. Aquitaine (Wells).—Salmon bronze on ochre ground; flowers large; 3 feet; October.

4. Baronne G. C. de Briailles (Dobbie).—Reddish-bronze; flowers medium; 2 feet; September.

90. Beacon (Wells).—Deep crimson; flowers medium; 2½ feet; free-flowering; mid-September.

294. Beauty (Wells).—Salmon shaded red; flowers large; September; 1 foot; habit poor.

295. Belle of Weybridge (Lowe).—Crimson, single, with prominent yellow centre; free-flowering; 2½ feet; September.

5, 91. Blue Boy (Wells).—Coppery-reddish violet with gold tips; flowers medium; very free-flowering; stiff, wiry habit; 4 feet; late September.

296. Black Prince (Wells).—Buff; flowers medium; 1½ foot; September.

280, 297. Blush Star (Wells).—Pink, single, with bright yellow centre; 2½ feet; early September.

6. Bobbie (Wells).—White, tinged with lilac; 2½ feet; free-flowering; September.

298. Bound's Favourite (Wells).—Orange-yellow, single; 2 feet; free-flowering; early September.

92. Border Beauty (Wells).—Fiery-orange, with gold tips and reverse; flowers medium; 2½ feet; very free-flowering; end of September.

7, 93. Bouquet Rose (Wells), **A.M.** October 25, 1910.—Rose, with gold centre; flowers medium; 2 feet.

240. Bretagne (Wells).—Rose, with gold centre; 2½ feet; flowers large; free-flowering; end of September.

299. Brightness (Wells).—Yellow, single; flowers medium; 2 feet; September.

249. Bronze B. Briele (Wells).—Bronze, tinged with rosy-pink; pompon; free-flowering; 2½ feet; September.

269. Bronze Blushing Bride (Dobbie).—Bronze-tinged pink; pompon; 2½ feet; September.

250, 270. Bronze Martinmas (Dobbie).—Bronze pompon; flowers medium; 2½ feet; early September.

300. Bronze Pagram (Wells).—Bright reddish-bronze, single; flowers large; 4 feet; late October.

8. Bronze Prince (Wells).—Bronze; 2½ feet; very free-flowering.

112. C. A. de Witt (Dobbie).—Reddish-mauve; flowers medium; 3 feet; October.

94. Caledonia (Wells), **A.M.** November 24, 1908.—Ivory-white, with incurving central florets; flowers large; 2½ feet; free-flowering habit.

251. Canarie (Wells).—Bright yellow pompon; free-flowering; 2½ feet; September.

103. Captivation (Wells).—Bright amaranth-red, with silver reverse; 2½ feet; free-flowering; October.

9. Carmelite (Dobbie).—Failed to flower.

10, 95. Carrie (Dobbie), **A.M.** September 23, 1902.—Deep golden-yellow; very free-flowering; 2½ feet; flowers medium; plants bushy in habit.

301. Carrie Luxford (Wells).—Crimson, single; very free-flowering; 2½ feet.

302. Cecil (Wells).—Crimson, with buff reverse; flowers large; 3 feet; mid-September.

96. Cecil Wells (Wells), **A.M.** September 29, 1910.—Buttercup-yellow, shaded with bronze in the centre; 2½ feet; flowers large.

97. Chaldon (Wells).—Deep reddish-crimson, with gold tips; flowers medium; 2½ feet; free-flowering habit; end of September.

98. Champagne (Wells). — Brilliant crimson-carmine; 4 feet; flowers medium; end of October.

11. Champ de Neige (Wells).—Failed to flower.

12, 99. Champ d'Or (Dobbie).—Pure yellow; 3 feet; very free-flowering; flowers large; October; good bushy habit.

100. Charles Schwarz (Wells).—Deep orange-crimson; 3 feet; end of October.

101. Charming (Wells).—Rose-pink, single, with yellow centre; 2½ feet; mid-September.

102. Château des Radrets (Vilmorin).—Rosy-mauve; flowers very large; 4 feet; vigorous habit; October; excellent for cutting.

104. Chatillon (Wells).—Yellow; flowers medium; 2 feet; September.

281. China (Wells).—Sulphur-yellow; single; 2½ feet; September.

105. Chrysie (Wells).—Pale rose-pink, fading to white; flowers medium; 2½ feet; mid-September.

106. Clara (Wells).—Canary-yellow; flowers medium; 2½ feet; very free-flowering habit; September.

303. Clarice (Wells).—Ruby-crimson; flowers small; very free-flowering; stems stiff and wiry; 2½ feet.

107. Comtesse de Cariel (Wells), **A.M.** October 22, 1897.—Orange-bronze; 2 feet; flowers rather small, but borne in great profusion.

108. Connie (Wells).—Primrose-yellow; 2 feet; petals quilled; flowers of medium size; blooms early in September; an excellent border variety.

109. Coral Queen (Wells).—Reddish-bronze; flowers small; 3½ feet; October.

304. Cornfield (Wells).—Yellow, single; 2½ feet; mid-September.

110. Crimson Diana (Wells).—Crimson; a sport from 'Diana'; September; 2½ feet.

13. Crimson Marie Masse (Dobbie).—Bronze; flowers medium; 2½ feet; free-flowering; sport from 'Mme. M. Masse.'

14, 111. Crimson Queen (Dobbie), **A.M.** October 25, 1910.—Deep crimson; flowers large, borne in great abundance; 3 feet; September.

282, 305. Daisy Bell (Wells).—White, single, tinged with pink; 2 feet; mid-September.

306. Dean Swift (Wells).—Bronzy-yellow, single; 1½ foot; bushy habit; mid-September.

117. Derbyshire Crimson (Wells).—Deep mahogany-red; flowers medium; 2½ feet; September.

113. Diadem (Wells).—Crimson, with buff reverse; 3½ feet; flowers medium, borne in great profusion.

15. Diana (Dobbie), **A.M.** September 29, 1910.—Bronzy-orange, shaded with gold; 2½ feet; flowers medium; habit bushy; September.

114. Diane (Nonin) (Wells).—Pure white; 2 feet; early October.

308. Dolly (Wells).—Deep yellow single; 1½ foot; flowers small; mid-September.

115. Dolly Prince (Wells).—Purest white; flowers large; 2 feet; September.

309. Dora (Wells).—Rosy-salmon, single; 2 feet; mid-September.

116. Dorothy Humphrey (Wells).—Bright pink with silver reverse; flowers medium; 3 feet; October.

307. Dr. Ingram (Wells).—Terra-cotta; flowers medium; 2½ feet; September.

252. Early Blush (Dobbie).—Rosy-pink; flowers small; 2½ feet; mid-September.

121. Edmond Duval (Dobbie).—White; flowers small; 2 feet; September.

16, 118. Eden (Dobbie), **A.M.** October 25, 1910.—Bright rose; flowers medium; 3 feet; very free-flowering habit; October.

310. Edith Pagram (Wells).—Bright rose, single; flowers medium 4 feet; October.

17. 119. Edith Syratt (Dobbie).—Deep rose; flowers medium and borne in great quantities; 3 feet; October.

120. Edith Wright (Wells).—Creamy-white tinged with rose; flowers not large; 2½ feet; mid-September.

122. Elaine (Wells), **A.M.** September 15, 1910.—Rosy-pink; flowers medium; 2 feet; habit very free-flowering; early September.

18. Elstob Yellow (Wells).—A deep yellow sport from the 'Masse' family; flowers of medium size; 3 feet; September.

124. E. Mathieu (Wells).—A large rosy-pink variety; 2½ feet; September.

19, 123. Emily (Dobbie, Wells).—White; bears large clusters of flowers in September; 2 feet.

283, 311. Eric (Wells).—Bronze on yellow ground; single; 2½ feet; mid-September.

20. Ernest Baltet (Wells).—Red shaded with old-rose of a very pleasing shade; flowers large; 3 feet; very free-flowering; October.

21, 125. Ethel (Wells), **A.M.** September 11, 1906.—Primrose with cerise shading at the base of the florets; a sport from 'Robbie Burns'; flowers large; 2½ feet; of very free-flowering habit.

126. Ethel Blades (Wells).—Yellow much marked with chestnut-brown; flowers small; plants very poor.

284, 312. Eva Grantham (Wells).—Pure white single; 1½ foot; September.

22, 127. Evelyn (Dobbie, Wells).—Crimson-bronze with buff reverse; petals quilled; flowers medium; 2½ feet; mid-September.

313. Evelyn Neale (Wells).—Old blood-red single; 3 feet; October.

128. Fée Japonaise (Dobbie), **A.M.** September 29, 1910.—Reddish-orange; flowers medium; 2½ feet; mid-September.

23. Fée Parisienne (Dobbie).—Deep mauve with long drooping florets; flowers large; 3 feet; blooms for a long period.

129. Fire Dragon (Wells).—Reddish-brown tinged with rose; flowers medium; 2½ feet; very free-flowering; October.

24, 131. Firefly (Dobbie).—Crimson-scarlet tinged with gold; 2½ feet; flowers medium; September and October.

132. Firelight (Wells).—Crimson, with gold reverse; flowers large; 3 feet; end of September.

133. Flame (Wells).—Deep crimson, with buff reverse; flowers large; 3 feet; mid-September.

25. Fleuve Rouge (Wells).—Coppery-red; flowers medium, borne in great profusion; 2½ feet; very free-flowering.

253, 271. Flora (Dobbie), **A.M.** September 15, 1910.—Golden-yellow pompon; 2½ feet; very free-flowering; August and September.

286, 315. Florence Gillham (Wells).—Pure white, single, with clear yellow centre; 2½ feet; flowers large; September.

316. Florrie (Wells).—Pink, single; 3 feet; September.

285. Formidable (Wells).—Rosy-pink, single; 2½ feet; very free-flowering.

26. Frankie (Wells).—Yellow, tinged with bronze; flowers medium; 2 feet; September.

254, 272. Fred Pele (Dobbie). Reddish-crimson pompon, with gold tips; 3 feet; September.

134. Freedom (Wells), **A.M.** October 25, 1910.—Rosy-purple; flowers large, borne in abundance; 2½ feet; October.

317. French Marigold (Wells).—Bronzy-yellow, single; 1½ foot; September.

318. F. W. Smith (Lowe).—Crimson; flowers medium; 2½ feet; October.

135. Gatton (Wells), **A.M.** September 29, 1910.—Blush-rose on a white ground; flowers large; 2½ feet.

27. G. Bouchariot (Improved) (Dobbie).—Orange-scarlet, with buff reverse; flowers large; habit very free-flowering; 3 feet; October.

136. Geisha (Vilmorin).—Failed to flower.

138. General Hawkes (Wells).—Rosy-crimson, with a lighter reverse; flowers large; 3 feet; September.

255, 273. Gentillesse (Dobbie).—Pale-yellow pompon; 2 feet; September.

319. Gem of Merstham (Wells).—Deep crimson, single; flowers large; 2 feet; October.

28, 137. George Bowness (Wells), **A.M.** September 12, 1905.—A crushed-strawberry sport from 'Crimson Masse'; flowers medium; 2 feet; mid-September.

139. Gertie (Wells), **A.M.** September 23, 1902.—Salmon-pink, shaded with gold; 2 feet; a continuous bloomer.

29, 140. Goacher's Crimson (Dobbie, Wells), **A.M.** September 10, 1901.—Bright crimson; flowers large; 2½ feet; September.

30. Goacher's Pride (Wells).—White, slightly tinged with lilac; flowers large; 2½ feet; very free-flowering.

321. Good Hope (Wells).—Rose-pink, with a zone of white round the centre; single; 2 feet; mid-September.

320. Gracie (Wells).—A bronzy-salmon, single; flowers large, very freely produced; September.

31, 141. Harrie (Wells), **A.M.** September 12, 1905.—Bronzy-orange on a gold ground; flowers medium, borne in great profusion; 2½ feet; September.

32, 142. Hermine (Wells).—Pure white; flowers large; 3½ feet; very free-flowering habit; October.

33. Hetty (Wells).—Delicate mauve; flowers medium; 2 feet; September.

287, 323. Hilda's Favourite (Wells).—Crimson, single; flowers large; 3 feet; September.

34, 143. Holmes' White (Dobbie).—White; flowers medium; 2 feet; end of August, September.

322. Honeysuckle (Lowe).—Not in flower November 5.

35. Horace Martin (Dobbie), **A.M.** September 24, 1901.—A deep-yellow sport from 'Crimson Marie Masse'; flowers medium, borne in great abundance; 2½ feet; very bushy habit.

36, 144. Improved Masse (Wells).—Rosy-lilac; flowers medium; plants weak.

145. Ivy Stark (Wells).—Yellow; flowers small; 1½ foot; September.

146. Janie Brown (Wells).—Purple; flowers small; 3 feet; October.

324. Jeanette (Wells).—Pink single; 2 feet; mid-September.

37, 147. Jenny (Dobbie, Wells), **A.M.** October 18, 1904.—Orange; flowers medium; 2½ feet; September.

148. Jessie Wallace (Wells).—Rosy salmon on a pale lemon-yellow ground; single; flowers medium; 3 feet; September.

130. J. H. Runchmer (Wells).—A terra-cotta single; flowers medium, borne in great profusion; 1½ foot; October.

38. Jimmie (Dobbie).—Crimson-purple; flowers large; 2½ feet; September.

149. Jules Mary (Wells), **A.M.** October 11, 1898.—Velvety crimson; flowers medium, produced very freely; 2½ feet; October.

39. Juliette (Wells).—White; flowers medium; 3 feet; very free flowering.

325. Juno (Wells).—Yellow single, shaded with bronze; 2 feet; mid-September.

288. Kathleen (Wells).—Golden-salmon single; 2 feet; profuse bloomer; end of August, September.

150. Keith (Wells).—Rose-pink on a cream ground; 2 feet; September.

326. Kitty Graham (Wells).—Chestnut-brown single; 1 foot; September.

289. Kitty Riches (Wells).—Pink single with large flowers; 3 feet; profuse bloomer; September.

40. Kuroki (Dobbie).—Bronze; 2 feet; plants very weak.

151. Lady Mary Hope (Wells).—Creamy-white; flowers large; 2½ feet; very free-flowering; September.

256. La Luxembourg (Dobbie).—Bronzy-yellow pompon; 1½ foot; mid-September.

257, 274. La Vierge (Dobbie).—Crimson with a buff reverse; flowers large; 3 feet; mid-September.

152. Le Cygne (Wells).—Pure white; flowers medium; borne on long stiff stems; 3 feet; October.

153. Lena (Wells).—Terra-cotta with gold points; flowers medium; 2 feet; end of August, September.

155. Leonard Peto (Wells).—Clear yellow; flowers medium; 2½ feet; September.

41, 154. Le Pactole (Wells).—Bronzy-yellow; flowers of medium size; 2½ feet; a strong grower and very free-flowering; end of September.

42, 156. Leslie (Dobbie), **A.M.** September 15, 1910.—Rich buttercup-yellow; 2 feet; flowers medium, borne in great profusion from the end of August till November.

43. 157. Lillie (Dobbie).—Pink; flowers large; 2 feet; free-flowering; mid-September.

327. Lady Ovenden (Wells).—Pure white single; 2 feet; very free-flowering.

158. Lizzie Adcock (Dobbie). **A.M.** November 6, 1900.—Bright golden yellow; a sport from 'Source d'Or'; flowers medium; 3 feet; October.

159. Lorraine (Wells).—Deep crimson purple; flowers medium; 3½ feet; October.

160. Lyon (Wells).—Lilac fading to white towards the centre; pompon; 2 feet; very free bloomer; October.

161. Mabel (Wells).—Bronzy-yellow; flowers medium; 2½ feet; September.

162. Mabel Roberts (Wells).—Deep pink; flowers medium, borne in long erect sprays suitable for cutting; 3½ feet; very free-flowering; October.

164. Madge Blick (Wells).—Claret, tinged with buff; flowers medium; 3½ feet; free-flowering habit; October.

45, 165. Maggie (Dobbie, Wells).—Bright golden-yellow; flowers medium; 2 feet; September.

167. Maggie Boyes (Wells).—Creamy-white, tinged with rose; medium-sized flowers; 2½ feet; very free-flowering.

328. Majestic (Wells).—A very bright fiery-red single; 3½ feet; flowers large, and very freely produced during September.

329. Majesticus (Wells).—Bronze single; 2½ feet; mid-September.

331. Marie Corelli (Wells).—Yellow single; 2 feet; September.

46. Market White (Dobbie). **A.M.** September 29, 1910.—White; 2½ feet; flowers large, borne in great quantities over an extended period from the middle of September.

259, 275. Martinmas (Dobbie).—Rose-pink pompon; 2½ feet; very free-flowering; September.

166. Marvel (Wells).—Bright-pink, single; 3 feet; flowers produced in great abundance during October.

330. Mary Anderson (Lowe).—White, suffused with pink; single; 2½ feet; October.

168. Maxim (Wells).—Bronze; flowers large; 2 feet; mid-September.

258. Mme. Jolivart (Dobbie).—White, tinged with rosy-pink; flowers medium, borne in great profusion; 2 feet; September.

44. Mme. Marie Masse (Wells).—Lilac-mauve; 2½ feet; free-flowering; August to October.

169. Medusa (Wells).—Bronzy-red, with a buff reverse; petals quilled; flowers medium; 2½ feet; September.

47. Merstham Bronze (Dobbie, Wells).—Bronze; 3 feet; flowers medium; September.

332. Merstham Glory (Wells).—Purple-crimson single; 2 feet; mid-September.

48. Merstham Pink (Wells).—Pale pink; flowers small; 2½ feet; very free-flowering.

49, 170. Mignon (Wells).—Golden-yellow pompon; 1 foot; September.

171. Mignon (Nonin), (Wells).—Pale rosy-pink; flowers large; produced in great abundance; 3 feet; September.

50, 172. Miss Balfour Melville (Dobbie), **A.M.** September 15, 1910.—Deep-bronze, with old-gold tips; flowers large; 2½ feet; September.

51, 173. Miss B. Miller (Dobbie).—Deep golden-yellow; petals quilled; flowers large; 2½ feet; mid-September.

174. Miss Davis (Wells).—Pink pompon; a sport from 'Mrs. Cullingford'; 3 feet; very free-flowering.

52. Miss Martin (Dobbie).—White, very faintly tinged with rose; flowers medium; 4 feet; October.

335. Miss Rose (Wells).—Soft-pink single; 2 feet; very bushy in habit; October.

163. Mlle. Aug. Dorey (Wells).—Not in flower November 5.

337. Monarch (Wells).—Bright-pink single; 2½ feet; mid-September.

53, 184. Monsieur G. Grünerwald (Dobbie).—Rose-pink; flowers small; 2 feet; October.

175. Mr. J. Hording (Wells).—Bright-yellow; flowers medium; very freely produced; 2½ feet; September.

260, 276. Mr. Selby (Dobbie), **A.M.** September 15, 1910.—Blush-pink pompon; 1½ foot; early September.

176, 182. Mrs. A. Cookson (Wells).—Crimson, with pale reverse; flowers large; 3 feet; mid-September.

54, 177. Mrs. A. Thomson (Dobbie, Wells), **A.M.** September 29, 1910.—Deep golden-yellow; flowers medium; 2 feet; very free-flowering; mid-September.

179. Mrs. Baird (Wells).—Delicate peach-bloom colour; a sport from 'Mme. M. Masse'; flowers large; 2 feet; mid-September.

180, 261, 277. Mrs. Cullingford (Dobbie).—White pompon; flowers large; 3½ feet; mid-September.

333, 334. Mrs. C. Curtis (Wells).—Crimson single; 2½ feet; September.

336. Mrs. Earle (Wells).—Pure white single; 2½ feet; mid-September.

56. Mrs. J. W. Scott (Wells).—White; flowers medium, produced very freely; 4 feet; October.

55. Mrs. J. R. Pitcher (Dobbie).—Pale rose; flowers medium; 4 feet; September.

181. Mrs. Tom White (Wells), **A.M.** October 25, 1910.—Amaranth-red; flowers large and very freely produced; 2½ feet; an excellent variety for cutting; October.

183. Mrs. W. A. Hobbs (Wells).—Rose, shaded with carmine; petals quilled; flowers large; 2½ feet; end of September.

57. Mrs. A. Willis (Dobbie).—Yellow, shaded with red; a sport from 'Mme. C. Perrier'; flowers medium; 2½ feet; very free-flowering.

58. Mrs. W. Sydenham (Wells).—Deep crimson; flowers medium; 2 feet; suitable for cutting; September.

185. Murillo (Wells).—Creamy-white, tinged with rose; flowers medium, produced in quantity; 3 feet; September.

186. Mychett Beauty (Dobbie).—Rich golden-yellow; flowers large; 3½ feet; an excellent variety for October flowering.

187. Mychett Pet (Wells).—Chestnut-red; flowers large; 1½ foot; habit, free-flowering and bushy; end of September.

59. Mychett Pink (Dobbie).—Pale pink; flowers medium; 1½ foot; September.

188. Mychett White (Wells).—Pure white; flowers medium; 2 feet; mid-September.

262, 278. Nanum (Dobbie).—White pompon, tinged with pink; very free-flowering; mid-September.

338. Nellie Riding (Wells).—Reddish-bronze, tinged deeply with gold; single; 3½ feet; very free-flowering; October.

60, 189. Nina Blick (Dobbie), **A.M.** September 15, 1910.—Reddish-bronze; 2½ feet; September; blooms produced in great abundance.

61. Nina Williams (Dobbie).—Dull crimson; flowers small; 3½ feet; October.

190. Nippon (Vilmorin).—Rosy-pink; flowers medium; petals quilled; 3 feet; October.

191. Normandie (Wells).—Delicate pink; flowers medium; 2 feet; mid-September.

62, 192. October Gold (Dobbie), **A.M.** October 25, 1910.—Old gold; flowers medium, produced in great quantity in long sprays suitable for cutting; 2½ feet; October.

193. O. J. Quintus (Dobbie).—Lilac-rose; flowers medium; 3 feet; free-flowering habit; October.

340. Olive (Wells).—A blush-pink single, with white centre; 1½ foot; September.

194. Onward (Dobbie).—Bronzy-yellow; flowers medium, produced in great profusion; 2½ feet; October.

63. Orange (Dobbie).—Orange-terracotta; 2½ feet; free-flowering; September.

195. Oubanghi (Vilmorin).—Golden-yellow; flowers medium; 2½ feet; October.

196. Ouragon (Vilmorin).—Yellow; flowers medium; 2½ feet; blooms till late in October.

64, 197. Parisiana (Dobbie).—Pure white; flowers medium, borne in large numbers; 2½ feet; October.

339. Pathfinder (Wells).—Yellow single; 1½ foot; mid-September.

198. Paul Valade (Wells).—Rose-pink; medium-sized flowers; 3 feet; September.

65, 199. Perfection (Dobbie).—White, shaded with blush when first opening; 2½ feet; September.

200. Perle Chatillonaise (Dobbie), **A.M.** September 29, 1910.—Creamy-white, with rose-shading; 3 feet; flowers large, and borne in great profusion; September.

66, 201. Perle Rose (Dobbie), **A.M.** October 18, 1904.—Pink; flowers medium; 2 feet; very free-flowering; end of September; stiff, erect habit.

341. Philadelphia (Wells).—Pink, with a white zone round the centre; single; 2½ feet; September.

279. Piercy's Seedling (Dobbie).—Orange-yellow pompon; 1½ foot; September.

342. Pink Beauty (Dobbie).—Rose-pink single, of medium size; 3 feet; mid-September.

67, 202. Pink Bedder (Wells).—Rose-pink pompon; 2 feet; October.

68. Polly (Dobbie), **A.M.** September 29, 1910.—Deep orange-yellow; flowers large, very freely produced; 2½ feet; September.

263. Précocité (Dobbie).—Bright-yellow pompon; 2½ feet; mid-September.

290. Pretty Polly (Dobbie, Wells).—Bronzy-yellow single; flowers medium; 1½ feet; September.

203. Pride of Hayes (Wells).—Bright-crimson; petals quilled; flowers large; 2½ feet; October.

204. Pride of Keston (Wells).—Reddish-rose; flowers large; 2 feet; end of September.

205. Pride of Merstham (Wells).—Reddish-purple single; 3 feet; October; flowers not well developed.

206. Primevère (Wells).—Primrose; flowers large; dwarf, bushy habit; 2 feet; October.

343. Prince (Wells).—Rose-pink single; 2 feet; flowers large; September.

207. Princess Eva (Lowe).—Not in flower November 5.

344. Prolific (Wells).—Bronzy-yellow single; 2 feet; flowers rather small; mid-September.

69, 208. Provence (Dobbie), **A.M.** September 29, 1910.—Bright pink, with gold points and centre; flowers medium; 2½ feet; September.

345. Purple Prince (Wells).—A large purple-rose single, with a silvery centre; 2½ feet; September.

346. Queen Auratia (Lowe).—Crimson, with paler reverse; flowers medium; 3 feet; October.

210. Rabelais (Wells).—Rosy-purple; flowers large; 3 feet; very free-flowering; September.

71. 211. Ralph Curtis (Dobbie).—A creamy-white sport from 'Mme. Marie Masse'; flowers large; 2 feet; September.

70, 209. Robbie Burns (Wells).—Pink sport from 'Mme. Marie Masse'; flowers medium; 2½ feet; October.

347. Reine des Roses (Lowe), **A.M.** November 7, 1905.—Rich, clear rose single, of good size; habit dwarf; very free-flowering; October to November.

349. Robert Johnson (Wells).—Mauve-pink single; very free-flowering; 2½ feet; October.

212. Roderic (Wells).—Pink single, with white zone round the centre; 3 feet; flowers medium; September.

213. Rodney Stone (Wells).—Brownish-crimson single; flowers medium; 2 feet; September.

72, 214. Roi des Blancs (Dobbie).—Pure white; 3 feet; flowers large, borne on long stems; very free-flowering; excellent for cutting in September.

216. Roi des Jaunes (Wells).—Yellow; flowers medium; 3 feet; September.

73, 217. Roi des Précoces (Dobbie).—Dark crimson, with a pale reverse; flowers large; very free-flowering; 3 feet; September.

215. Roi des Violets (Vilmorin).—Not in flower November 5.

74, 219. Rosie (Dobbie, Wells).—Terra-cotta; flowers large; 3 feet; September.

218. R. Pemberton (Wells).—Amaranth-red; flowers large; 3 feet; very free-flowering; October.

220. Ryecroft Beauty (Dobbie).—Soft pink; 3½ feet; free-flowering; October.

222. St. Mary (Wells).—White; flowers small; 1½ foot; mid-September.

75. Sally (Dobbie, Wells).—Coral-pink; flowers medium; petals quilled; 3 feet; very free-flowering; September.

223. Sir Herbert (Wells).—Bronze; flowers medium; 2 feet; free-flowering; mid-September.

221. Snowstorm (Wells), **A.M.** October 25, 1910.—A large white single, having broad, stiff florets; 2½ feet; very profuse bloomer, and excellent for cutting; October.

291. Spitfire (Wells).—Fiery-crimson single, shading off to brilliant red, with gold points and reverse; 2½ feet; early October.

348. Sunset (Wells).—Failed to flower.

76, 224. Tapis de Neige (Dobbie). **A.M.** September 29, 1910.—Pure white; flowers medium, borne in great profusion; 2½ feet; September.

225. Tapis d'Or (Wells).—Golden-yellow; flowers medium, borne in great abundance; 2½ feet; September.

226. T. Banister (Wells).—Yellow; flowers medium; 2½ feet; mid-September.

350. Terpsichore (Wells).—Light yellow, single; 1½ foot; mid-September.

227. Terra Cotta (Lowe).—Scarlet-orange single; flowers small; 3 feet; October.

351. The Downs (Wells).—A large rosy-lilac single; 2 feet; mid-September.

352. The Navy (Wells).—A reddish terra-cotta single; 2 feet; very profuse bloomer; September.

77, 228. The Sparkler (Dobbie).—Mahogany-red, with a buff reverse; 1½ foot; mid-September.

353. The Veldt (Wells).—Antique-red single; flowers medium, borne in great abundance; 2½ feet; September.

229. Tom Thumb (Wells).—Yellow, suffused with pink; flowers small; 2½ feet; very freely produced; September.

78. Tonkin (Wells).—Reddish-orange; flowers medium; 3 feet; very free-flowering habit; September.

264. Toreador (Dobbie).—Reddish-bronze pompon, shaded with gold; 2 feet; September.

79. Tottie (Wells).—Reddish-orange; flowers medium; 2 feet; end of August, September.

230. Triumphant (Wells).—Rose-pink; flowers large; 4 feet; stems stiff and erect, making it an excellent variety for cutting in October.

80. Tuckswood Early (Dobbie).—White; flowers medium; 1½ foot, very free-flowering; mid-September.

231. Venise (Wells).—Salmon-buff; flowers large; 2½ feet; mid-September.

232. Vésuve (Wells).—Chestnut-red; flowers large; 2½ feet; very free-flowering, and bushy in habit; September.

233. Walton Bradbury (Wells).—Large white single, with yellow centre; 2 feet; mid-September.

234. Weald (Wells).—Bright rosy-pink single; flowers small; 2 feet; September.

235. Wells' Masse (Wells), **A.M.** September 12, 1905.—White sport from 'Mme. Marie Masse,' slightly shaded with blush; flowers large, borne in abundance; 2 feet; September.

292. Wells' Pride (Wells).—Bronzy-red; single; flowers large; 2 feet; September.

236 Wells' Primrose (Wells).—Pale primrose-yellow; flowers medium; 3 feet; free-flowering; September.

81, 178. Wells' Scarlet (Wells), **A.M.** October 25, 1910.—Scarlet terra-cotta; flowers medium; 3 feet; September.

82, 237. White Mme. Masse (Dobbie).—Creamy-white; flowers medium; 2½ feet; September.

238. Whitepoint (Wells).—Reddish-lilac, with white points to the florets; 2½ feet; September.

83, 239. White Quintus (Dobbie).—A pure white sport from 'O. J. Quintus'; flowers medium; 3 feet; October.

265. White St. Crouts (Dobbie).—A white sport from 'St. Crouts'; pompon; 2 feet; mid-September.

354. Yallergal (Wells).—Bright yellow single; flowers small; 1 foot; September.

GLADIOLI AT WISLEY, 1910.

Two hundred and nineteen stocks of Gladioli were received for trial, all of which were planted in a rather sheltered position, on ground that had been dug to the depth of 18 inches and lightly manured. All made excellent growth, and the collection was much admired. The Committee examined the collection on two occasions.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.
XXX = Highly Commended.

Varieties.

*1. Adelina.
2. Admiral Togo.
3. Alcibiade.
4. Alexander Edward.
5. Alice Wood.
6. Almira.
7. America.
8. Angelina.
9. Anthony Longside.
10. Aristophane.
11. Ayrton.
12. Bellini.
13. Blue Jay.
14. Brightness.
15. Britannia.
16. Brooklands.
17. Canicule.
18. Canning.
19. Cardinal.
20. C. E. J. Esdale.
21. Commandant Deloncle.
22. Conqueror.
23. Countess Amy.
24. Countess of Leicester.
25. Countess of Suffolk.
26. Darkness.
27. Dawn.
28. Decima.
29. Dovedale.
30. Duchess of Leeds.
31. Duke of Buccleuch.
32. Duke of Richmond.
33. Harold Longster.
34. Edward VII.
35. Ellen Terry.
36. Empress Frederick.
37. Empoclus.
38. Euler.
39. Eteocles.
40. Eugene Sandow.
41. Eunice.
42. Exonia.
43. Exposition de Saint-Louis.
44. Figaro.
45. Huish Tower.
46. Flambeau.
47. Florence.
48. Gargantua.
49. General Kuroki.
50. Girton.
51. Grand Vainqueur.
52. Granité.
53. Groff's Blue Hybrids.
54. Groff's Dark Hybrids.
55. Groff's Gold Medal Hybrids.
56. Groff's Light and Yellow Hybrids.
57. Groff's Purple Hybrids.
58. Groff's Yellow Hybrids.
59. Hannibal.
60. Ideal.
61. Indiana.

* See footnote p. 672.

62. Isabelle.
63. J. Chetwood Aikin.
64. John Churchill Cragie
65. J. L. Clucas.
66. King of Gladioli.
67. Lady Macdonald.
68. Lady Macfarren.
69. Lady May Lyon.
70. Lady Muriel Digby.
71. Lady Haddo.
72. Lady Young.
73. La Gloire.
74. La Luna.
75. Le Triomphe.
76. Lord Errol.
77. Lord Iveagh.
78. Lutin.
79. Maharajah of Kolhapur.
80. Marie Thérèse.
81. Melusine.
82. Merlin.
83. Miss Kelway.
84. Miss Zena Dare.
85. Monsieur B. Verlot.
86. Mrs. F. Field.
87. Mrs. G. W. Willock.
88. Mrs. Lund.
89. Orme.
90. Parlamante.
91. Patrie.
92. Peace.
93. Phineas.
94. Pie X.
95. Prince Henry of York.
96. Prospero.
97. Queen Maud.
98. Ribera.
99. Richard Martin.
100. Rock Sand.
101. Rosalind.
102. Safrano.
103. Sea Mouse.
104. Sibérie.
105. Sir Marcus Samuel.
106. Sir H. D. Wolff.
107. Sir. Thos. Drew.
108. Sir William Ingram.
109. Spiller.
110. Sunray.
111. Turenne.
112. Unionist.
113. Utopia.
114. Vesta.
115. Viscountess Iveagh.
116. Warrior.
117. Warwick Pageant.
118. Wonder.
119. Zephyr.
120. Zoe.
121. Cylindus.
122. Achalm.
123. Bruno Frank.
124. Deutsche Kaiserin.
125. Dora Krais.
126. Frau Bopp-Glaser.
127. Frau Fritz Krüger.
128. Frau Herme Seidel.
129. Frau Jeanne Lohe.
130. Fräulein Gabriele Charton.
131. Fräulein Johanna Pfitzer.
132. Friedrich Schöllhammer.
133. Grosspapa Pfitzer.
134. Hasenberg.
135. Heinrich Küster.
136. Hohenstaufen.
137. Hohentwiel.
138. Julius Naumann.
139. Karl Luz.
140. Königin Charlotte.
141. Lapageria.
142. Marianne.
142A. Mephisto.
143. Meteor.
144. Negerfürst.
145. Prinzessin Viktoria Luise.
146. Rechberg.
147. Sarah Vautier.
148. Europa.
149. Butterfly.
150. Ceres.
151. Chamont.
152. Conquête.
153. Corinne.
154. Corsaire.
155. Countess of Craven.
156. Docteur Fontan.
157. Duchess of Edinburgh.
158. Duchess of Fife.

159. John Bull.
160. Lotus.
161. Mr. Bains.
162. Mrs. Krelage.
163. Mrs M'Alister.
164. Pepita.
165. Polites.
166. Pyrene.
167. Shakespeare.
168. Sylphide.
169. America.
170. Brilliant.
171. Deborah.
172. Governor McCormack.
173. Lydia.
174. Oddity.
175. Portland.
176. Salem.
177. Siboney.
178. Variabilis.
179. Ferdinand Kegelgan.
180. G. A. Kuyk.
181. General Frey.
182. General Stoessel.
183. Isarine.
184. Ministre Pichon.
185. Mrs. Francis King.
186. Paul Crampel.
187. Valmy.
188. America.
189. Blue Jay.
190. La. Luna.
191. Princeps.
192. Canicule.
193. Étincelle.
194. Fernando Cortez.
195. Gallieni.
196. Grand Vainqueur.
197. Klondyke.
198. Lampadaire.
199. Magnificus.
200. Merlin.
201. Michigan.
202. Miss Willmott.
203. Rose des Haies.
204. Thibet.
205. White Lady.
206. White Queen.
207. Baron J. Hulot.
208. Casque d'Or.
209. Fred. Passy.
210. Lafayette.
211. Léon Jenin.
212. Mephistopheles.
213. President Magnaud.
214. Princess Altieri.
215. *primulinus*.
216. Victory.
217. Klondyke.
218. Giant Pink.
219. Taconic.

122. Achalm (Pfitzer).—Magenta, with sulphur-yellow markings at the base of the lower petals; flowers large; spike short.

1. Adelina (Kelway).—Deep salmon-pink; flowers medium; spike short.

2. Admiral Togo (Kelway).—Failed to flower.

3. Alcibiade (Vilmorin).—Rosy-pink, with a white line down the middle of the lower petals; flower and spike small.

4. Alexander Edward (Kelway).—Vermilion-red, marbled with a deeper shade; lower petals streaked with crimson; flowers medium; spike good.

5. Alice Wood (Kelway).—Creamy-white, streaked with crimson at the edges of the petals; lower petals yellow; flowers small; spike short.

6. Almira (Burrell).—Cerise-pink, shaded with slaty-violet at the edges of the petals; lower petals blotched with white; flowers small; spike short.

7, 169, 188. America (R. Veitch, Dobbie, Barr).—Very pale pink, streaked with rose at the tips of the petals; lower petals blotched with magenta; flowers medium; spike good.

8. Angelina (Kelway).—Salmon-pink, shaded and blotched with dull dark-crimson; flowers medium; spike good; early flowering.

9. Anthony Longside (Kelway).—Carmine-red; lower petals shading to amber-white at the base, streaked and spotted with carmine-red; flowers large; spike tall; a good decorative variety.

10. Aristophane (Vilmorin).—Pale salmon-pink; lower petals blotched with pale yellow and crimson; flowers large; spike good.

11. Ayrton (Burrell).—Pale rose, streaked with a brighter shade; lower petals blotched with rosy-magenta; flowers large; spike good.

207. Baron J. Hulot (Barr).—Deep purple; lower petals with a splash of yellow in the middle; flowers small; spike medium.

12. Bellini (Kelway).—Failed to flower.

13, 189. Blue Jay (R. Veitch, Barr).—Light bluish-violet; middle lower petal has the base purple and a streak of pale yellow down the centre; flowers medium; spike good.

14. Brightness (Kelway).—Bright cochineal-red; flowers medium; spike good; a useful variety for garden decoration.

170. Brilliant (Dobbie).—Bright fiery-red, streaked with a duller shade; lower petals white at the base, spotted with purple; flowers medium; spike good.

15. Britannia (Kelway).—Salmon-pink, much blotched with slaty-violet; flowers small; spike short.

16. Brooklands (Kelway).—Pale salmon-pink; lower petals blotched with amber-white; flowers medium; spike good.

123. Bruno Frank (Pfitzer).—Failed to flower.

149. Butterfly (Dobbie).—Pale yellow, flushed with peach blossom; flowers medium; spike good.

17, 192. Canicule (Vilmorin, Barr).—Turkey-red; all the petals are more or less blotched with pale yellow; flowers large; spike tall and bold.

18. Canning (Kelway).—Bright salmon-pink; lower petals marked with very bright crimson; flowers medium; spike good.

19. Cardinal (Vilmorin).—Fiery-red, marbled with slate-violet; middle lower petal blotched with crimson; flowers medium; spike good.

208. Casque d'Or (Barr).—Greenish-yellow; lower petals blotched with dull dark-crimson; flowers small; spike good.

20. C. E. J. Esdale (Kelway).—Scarlet, mottled with vermilion-red; flowers medium; spike good.

150. Ceres (Dobbie).—White, shaded with pale lilac-rose; lower petals blotched with crimson; flowers medium; spike good.

151. Chamont (Dobbie).—Rose, tinged with lilac; flowers medium; spike good.

21. Commandant Deloncle (Vilmorin). — Lilac-purple; lower middle petal nearly all amber-white, with a streak of dark crimson in the middle; flowers medium; spike very fine.

22. Conqueror (R. Veitch).—Failed to flower.

152. Conquête (Dobbie).—Bright rosy-crimson; base of petals white; middle lower petal blotched with white; flowers very late, medium.

153. Corinne (Dobbie).—Pale lilac, splashed with crimson; flowers small, spike good.

154. Corsaire (Dobbie).—Currant-red, with deep blood-red markings; flowers small; spike good.

23. Countess Amy (Kelway), **A.M.** August 10, 1897.—Rosy-pink, streaked with crimson; all the petals have a white streak in the middle, and the two lower ones are blotched with cream; flowers small; spike good.

155. Countess of Craven (Dobbie).—Pale rose, shading to bright crimson at the edges; middle lower petal blotched yellow; flowers and spike medium.

24. Countess of Leicester (Kelway), **A.M.** August 10, 1897.—Salmon-pink, blotched with a darker shade at the tips of the petals; base of lower petals amber-white, spotted with pink; flowers very large, being 6 inches across; spikes 2½ feet long; an excellent decorative variety, being the first to flower in the trial.

25. Countess of Suffolk (Kelway).—Crimson-carmine, shading to a lighter shade at the base of the petals, each of which has a pale yellow streak down the middle; flowers medium; spike good.

121. Cylindus (Kelway).—Rosy-pink; flowers small; spike good.

26. Darkness (Kelway).—Deep scarlet; flowers medium; spike good.

27. Dawn (Burrell).—Pale rose, streaked with a darker shade; lower petals blotched with rosy-magenta; flowers medium; spike good.

171. Deborah (Dobbie).—Crimson; lower petals blotched with creamy-white; flowers medium; spike good.

28. Decima (Burrell).—Pale rose, splashed with purple-rose marking; lower petals blotched with light purple; flowers large; bold spike.

124. Deutsche Kaiserin (Pfitzer).—White, with a trace of crimson at the base of the petals; flowers large; spike tall.

156. Docteur Fontan (Dobbie).—Pale lilac-rose; flowers small; spike poor.

125. Dora Krais (Pfitzer).—Pale amber-yellow; lower petals blotched with magenta; slightly waved; flowers medium; bold spike.

29. Dovedale (Kelway).—White, with pale-rose markings; flowers small; spike poor.

157. Duchess of Edinburgh (Dobbie).—Pale lilac, splashed with crimson; flowers small; spike short.

158. Duchess of Fife (Dobbie), **A.M.** August 27, 1889.—Cerise-pink; lower petals blotched with creamy-white; flowers medium; spike bold.

30. Duchess of Leeds (Kelway).—White, blotched with rosy-purple; two of the four corms produced double flowers; flowers medium; spike good.

31. Duke of Buccleuch (Kelway).—Pale salmon-pink; lower petals blotched with amber-white and spotted with reddish-purple at the base; flowers medium; spike tall.

32. Duke of Richmond (Kelway), **A.M.** August 6, 1907.—Carthamus-red; lower petals blotched with creamy-white; flowers large, borne on a tall spike.

34. Edward VII. (Kelway).—Carthamus-red; lower petals blotched with cream and having a deep purple streak running to the base; flowers large, borne on a bold spike.

35. Ellen Terry (Kelway).—White, splashed with rosy-pink; lower petals more deeply tinged with rosy-pink and the middle one having a cream blotch; flowers medium; spike good.

36. Empress Frederick (Kelway).—A beautiful clear primrose-yellow; lower petals blotched with crimson; flowers medium; spike good.

37. Empoclus (Kelway).—Pink; middle lower petal largely pale yellow; flowers large, borne on a tall spike.

38. Euler (Kelway).—Bright salmon-pink; lower petals marbled with white; flowers large; spike tall.

193. Ēteocles (Kelway).—Deep salmon-pink; flowers medium; spike good.

193. Étincelle (Barr).—Bright cerise; lower petals streaked with dull crimson; flowers medium; spike good.

40. Eugene Sandow (Kelway).—Pale carthamus-red, with violet streaks; middle lower petal blotched with cream; flowers large; spike medium.

41. Eunice (Burrell).—Rosy-pink, streaked with crimson; flowers medium; spike poor; a very late-flowering variety.

148. Europa (Pfitzer), **A.M.** August 16, 1910.—White, with a faint trace of magenta at the base of the petals; flowers large, borne on a bold spike.

42. Exonia (R. Veitch).—Salmon-pink, flaked with slate-violet; lower petals blotched with white; flowers and spike medium.

43. Exposition de Saint-Louis (Vilmorin).—Bright crimson, with a white streak down the middle of each petal; flowers medium; spike good.

179. Ferdinand Kegelgan (Barr).—Vermilion-red; base of lower petals yellow; flowers large; spike poor.

194. Fernando Cortez (Barr), **XXX** August 23, 1910.—Primrose-yellow; lower petals streaked with dull red; flowers and spike medium.

44. Figaro (Vilmorin).—Pale primrose-yellow, slightly mottled with claret; flowers large; spike good.

46. Flambeau (Burrell).—Cerise-pink, with white blotches; flowers and spike small.

47. Florence (Vilmorin).—Rosy-magenta, deeper at the tips of the petals; lower petal blotched with cream; flowers medium; spike good.

126. Frau Bopp-Glaser (Pfitzer).—Bright rose; lower petals blotched with crimson and streaked with white; flowers and spike small.

127. Frau Fritz Krüger (Pfitzer).—Creamy-yellow, marked with magenta at the base; lower petals blotched with magenta; flowers and spike medium.

128. Frau Herme Seidel (Pfitzer).—Petals pink; marbled and much blotched with slate-violet; middle of lower petals marked with white.

129. Frau Jeanne Lohe (Pfitzer).—Scarlet, marked with purple; flowers and spike medium.

130. Fräulien Gabriele Charton (Pfitzer).—Failed to flower.

131. Fräulein Johanna Pfitzer (Pfitzer).—Pink, marbled and much blotched with slate-violet; middle lower petal marked with crimson; flowers medium; spike good.

209. Fred Passy (Barr).—Creamy-white, with a tinge of lilac; lower petals yellow blotched with crimson; flowers and spike medium.

132. Friedrich Schöllhammer (Pfitzer).—White; waved; lower petals faintly streaked in the middle with mauve; flowers and spike medium.

180. G. A. Kuyk (Barr).—Purplish-red; base of lower petals white, streaked and spotted with a similar colour to that of the other petals; flowers large, borne on a tall spike.

195. Gallieni (Barr).—Bright cerise; lower petals marked with creamy-white; flowers medium; spike poor.

48. Gargantua (Vilmorin), **XXX** August 23, 1910.—Pale rose, streaked with bright rosy-magenta; white streak in the middle of the petals; middle lower petal blotched with white; flowers large; spike medium.

181. General Frey (Barr).—Currant-red, with deeper markings at the edges; lower petal blotched with creamy-white and splashed with currant-red; flowers medium; spike good.

49. General Kuroki (Kelway).—Crimson-carmine; middle lower petal having a large blotch of very pale yellow; flowers and spike medium.

182. General Stoessel (Barr).—Salmon-rose, splashed with deep rose; lower petal blotched with purple; flowers and spike medium.

218. Giant Pink (Cowee).—Rose-pink; lower petals blotched with crimson; spike and flowers medium.

50. Girton (Burrell).—Failed to flower.

172. Governor McCormack (Dobbie).—Rosy-pink, with deeper streaks towards the tips of the petals, splashed with slate-blue markings; lower petal blotched with cream; flowers medium; spike good.

196. Grand Vainqueur (Barr).—Rose, blotched with cream; flowers medium, borne on a bold spike.

51. Grand Vainqueur (Vilmorin).—Pale lilac, much streaked with bright crimson; base of petals white; flowers medium, borne on a tall spike.

52. Granité (Vilmorin).—Cerise, slightly mottled with a darker shade; lower petals creamy-white, marked with purple; flowers medium; spike good.

53. Groff's Blue Hybrids (R. Veitch).—Lilac-purple; lower petals blotched with yellow; flowers and spike medium.

54. Groff's Dark Hybrids (R. Veitch).—Dark fiery-red; lower petals blotched with deep crimson and some yellow; flowers medium; spike good.

55. Groff's Gold Medal Hybrids (R. Veitch).—Amber-white; lower petals blotched with purple-garnet; flowers small; spike medium.

56. Groff's Light and Yellow Hybrids (R. Veitch).—White and pale yellow, tinged with pale lilac; lower petals blotched with crimson; flowers medium; spikes rather poor.

57. Groff's Purple Hybrids (R. Veitch).—Deep violet-purple; lower petals having a small yellow streak in the middle; flowers and spike small.

58. Groff's Yellow Hybrids (R. Veitch).—Pale lemon-yellow faintly tinged with red in the middle of the petals; lower petals more deeply tinged with red and blotched with mahogany-red; flowers medium; spike good.

133. Grosspapa Pfitzer (Pfitzer).—Salmon-pink; lower petals shading to pale yellow at the base and streaked with crimson; flowers large, borne on a good spike.

59. Hannibal (Kelway).—Pale salmon-pink; lower middle petal blotched with Tyrian rose; flowers medium; spike good.

33. Harold Longster (Kelway).—Rosy-pink; lower petals blotched with pale sulphur-yellow; flowers medium; good spike.

134. Hasenberg (Pfitzer).—Amaranth-red, fainter towards middle of petals; lower petal streaked with magenta; flowers and spike medium.

135. Heinrich Küster (Pfitzer).—Dull deep-crimson; streak of white on lower petals; flowers and spike medium.

136. Hohenstaufen (Pfitzer).—Pale rose, white towards the edges of the petals, which are slightly waved; lower petal blotched with mahogany-red on pale yellow ground; flowers and spike medium.

137. Hohentwiel (Pfitzer).—Bright cerise; lower petals blotched with primrose-yellow and streaked with cerise; flowers and spike rather small.

45. Huish Tower (Kelway).—Scarlet, shading to white at the base of the petals; lower petals with a streak of magenta; flowers medium, borne on tall spike.

60. Ideal (Burrell).—Failed to flower.

61. Indiana (Kelway).—Amaranth-red; base of lower petals white, pencilled with red; flowers small; spike good.

62. Isabelle (Vilmorin).—Creamy-white, streaked with crimson at the edges; flowers medium; spike tall.

183. Isarine (Barr).—Pale mauve, streaked with magenta; blotched with deep magenta on creamy-white ground; flowers and spike medium.

63. J. Chetwood Aikin (Kelway).—Deep crimson; flowers and spike medium.

159. John Bull (Dobbie).—Rosy-pink, blotched with crimson; flowers and spike poor; failed to flower till end of September.

64. John Churchill Cragie (Kelway).—Pale salmon-pink, streaked with carmine; cream line down middle of each petal; lower petals blotched with pale lemon-yellow; flowers large, borne on a bold spike.

138. Julius Naumann (Pfitzer).—Pale rose, deeper towards the tips of the petals; lower petals blotched with crimson and having a dark streak in the middle; flowers and spike medium.

65. J. L. Clucas (Kelway).—Russet-orange; lower petals blotched with white; flowers medium; spike good.

139. Karl Luz (Pfitzer), **A.M.** August 16, 1910.—Failed to flower at Wisley, but, as shown at the R.H.S. Hall, was of a deep crimson-maroon with chocolate-coloured throat.

66. King of Gladioli (Kelway).—Bright salmon-pink; middle lower petal shading to white, and spotted at the base with vermilion-red; flowers large, borne on a very tall, bold spike.

217. Klondyke (Cowee).—Pale lemon-yellow; lower petals blotched with crimson; flowers and spike medium.

197. Klondyke (Barr).—Failed to flower.

140. Königin Charlotte (Pfitzer).—White, streaked with pale lilac; lower petals blotched with purplish-crimson; flowers and spike medium.

71. Lady Haddo (Kelway).—White, tinged with rosy-lilac at the margins of the petals; lower petals shading to lemon-yellow at the base and streaked with dull crimson; flowers medium; spike good.

67. Lady Macdonald (Kelway).—Amaranth-red, streaked with dark violet; lower petals spotted with white at the base; flowers small; spike medium.

68. Lady Macfarren (Kelway).—Bright rosy salmon-pink; lower petals blotched with amber-white and spotted with pink; flowers very large, being 6 inches across; spike good.

69. Lady May Lyon (Kelway).—Pale rosy-lilac, shading lighter towards the middle; lower petals blotched with pale ochre; flowers and spike medium.

70. Lady Muriel Digby (Kelway), **A.M.** August 18, 1903.—Amber-white; upper petals margined with a delicate shade of pink; lower petals marked with blood-red and silvery-mauve; flowers large, 4½ inches across; spike tall and blod.

72. Lady Young (Kelway).—Lilac-crimson; lower petals blotched with very pale yellow; flowers medium; spike poor.

210. Lafayette (Barr).—Rose; lower petals blotched with pale yellow and deep dull crimson; flowers large; spike medium.

73. La Gloire (Vilmorin).—Bright scarlet; lower petals blotched with white and edged with crimson; flowers medium; spike good.

74, 190. La Luna (R. Veitch, Barr), **A.M.** August 30, 1910.—Creamy-white; lower petals blotched with crimson; flowers and spike good.

198. Lampadaire (Barr).—Failed to flower.

141. Lapageria (Pfitzer).—Failed to flower.

211. Léon Jenin (Barr).—Crimson, blotched with yellow; flowers medium; spike good.

75. Le Triomphe (Vilmorin), **XXX** August 23, 1910.—Pale rosy-magenta, streaked with currant-red, lower petals blotched with creamy-white; flowers large borne on a bold spike.

76. Lord Erroll (Kelway).—Cerise-pink; middle lower petal marked with dark crimson and white; spike and flowers medium.

77. Lord Iveagh (Kelway).—White, marbled with rosy-lilac; flowers medium; spike good.

160. Lotus (Dobbie).—Very pale yellow, flushed with pink at the edges; flowers and spike medium.

78. Lutin (Vilmorin).—Deep cerise-pink; lower petals marked with dark crimson and white; flowers large; spike tall.

173. Lydia (Dobbie).—Rose, splashed with white, deepening towards the base of the middle lower petal; flowers and spike medium.

199. Magnificus (Barr).—Scarlet, streaked with white; lower petals blotched with white and tinged with mauve; flowers medium; spike poor.

79. Maharajah of Kolhapur (Kelway).—Currant-red, faintly streaked with purple; lower petals blotched with lemon-yellow; flowers small; spike medium.

142. Marianne (Pfitzer).—White; lower petals blotched with rosy-magenta; flowers and spike medium.

80. Marie Thérèse (Vilmorin).—White; lower petals tinged with pale yellow; flowers medium, borne on a good spike.

81. Mélusine (Vilmorin).—Rosy-pink, marked with white streak in the middle of the petals; lower petals blotched with sulphur-yellow; flowers very large, borne on a tall, bold spike. This variety continued in flower till late in the season.

142A. Mephisto (Pfitzer).—Geranium-lake, marbled with carmine-red; flowers medium; spike good.

212. Mephistopheles (Barr).—White, shaded with very pale lilac; lower petals blotched with crimson and yellow; flowers and spike medium.

82, 200. Merlin (Vilmorin, Barr).—Deep cerise, blotched with pale lemon-yellow; base of lower petal streaked with purple; flowers medium; spike good.

143. Meteor (Pfitzer).—Cochineal-red; lower petals darkening to purple at the base; flowers and spike medium.

201. Michigan (Barr).—Scarlet; lower petals blotched with white; flowers medium, borne on a bold spike.

184. Ministre Pichon (Barr).—Crimson; base of lower petals white, streaked and spotted with crimson; flowers and spike medium.

83. Miss Kelway (Kelway).—Pale lilac-rose, streaked with a darker shade; the petals have a pale yellow line down the middle, and the lower middle petal has a large blotch of sulphur-yellow; flowers medium, borne on a bold spike.

84. Miss Zena Dare (Kelway), **A.M.** August 9, 1904.—Amber-

white; two lower petals pale yellow streaked with dull crimson; flowers and spike medium.

202. Miss Willmott (Barr).—Failed to flower.

85. Monsieur B. Verlot (Vilmorin).—Amaranth-red, streaked with purple; lower petals blotched with lemon-yellow; flowers and spike medium.

161. Mr. Bains (Dobbie).—Bright scarlet, with crimson streaks on the lower petals; flowers and spike medium.

86. Mrs. F. Field (Kelway).—White; the middle of the lower petals pencilled with very faint mauve lines; flowers and spike medium.

185. Mrs. Francis King (Barr).—Bright salmon-pink, streaked with crimson; flowers large; spike tall.

87. Mrs. G. W. Willock (Kelway).—Delicate pink, lower petals having pale yellow blotches spotted with rosy-pink; flowers large, borne on a tall spike.

162. Mrs. Krelage (Dobbie).—Deep salmon-pink; lower petals streaked with crimson; flowers and spike medium.

88. Mrs. Lund (Kelway).—White, splashed with rose at the tips; lower petals tinged with yellow; flowers small; spike medium.

163. Mrs. M'Alister (Dobbie).—Light rose, streaked with a darker shade; inner petals tinged with yellow, with purple markings at the base; flowers medium, borne on a bold spike.

144. Negerfürst (Pfitzer).—Dark red, with a small yellow blotch on the lower petals; flowers medium; spike good.

174. Oddity (Dobbie).—Cerise, shading to deep crimson at the tips of the petals; base of lower petal white spotted with bright crimson; flowers and spike medium.

89. Orme (Kelway).—Failed to flower.

90. Parlamante (Kelway).—Bright salmon-pink; base of petals white, the lower one having a large white blotch shaded with crimson; flowers medium; spike poor.

91. Patrie (Vilmorin).—Bright carmine-red; petals marked with yellow; flowers large, borne on a good spike.

186. Paul Crampel (Barr).—Rosy-crimson; lower petals streaked and spotted; flowers medium; spike poor.

92. Peace (R. Veitch).—White, tinged with rosy-pink; lower petals blotched with crimson; flowers medium; spike poor.

164. Pepita (Dobbie).—Yellow, with crimson streaks; flowers and spike very poor.

93. Phineas (Burrell).—Pink, spotted with crimson; flowers large, borne on a bold spike.

94. Pie X. (Vilmorin).—Bright rosy-pink; lower petals largely white, with a crimson blotch in the middle; flowers large; spike tall.

165. Polites (Dobbie).—Salmon-pink, with crimson streaks; flowers medium; spike poor.

175. Portland (Dobbie).—A Childsii variety of a pale-rose colour with darker streaks; middle lower petal blotched with white and splashed with crimson; flowers medium; spike good.

213. President Magnaud (Barr).—Pink; lower petals blotched with crimson and white; flowers medium; spike good.

95. Prince Henry of York (Kelway).—Bright scarlet, with a crimson blotch on the lower petal; flowers medium; spike good; same as 'King of Scarlets.'

191. Princeps (Barr).—Failed to flower.

214. Princess Altieri (Barr).—White, tinged with pale lilac; lower petals marked with plum-violet; flowers and spike of medium size.

145. Prinzessin Viktoria Luise (Pfitzer).—Salmon-pink, streaked with a darker shade; buff markings on the lower petals; flowers medium; spike good.

215. *primulinus* (Kelway), **A.M.** August 16, 1910.—Primrose-yellow, with a faint streak of crimson in the middle of some of the petals; flowers borne four or five in a lax spike about 18 inches long. Introduced from south-east tropical Africa in 1889.

96. Prospero (Burrell).—White, much streaked with lilac-rose; lower petals with a crimson line in the middle; flowers medium; spike tall.

166. Pyrene (Dobbie).—A delightful shade of rosy-pink, with crimson markings on the lower petals; flowers medium; spike good.

97. Queen Maud (Kelway).—Cerise; lower petals amber-white streaked with crimson; flowers large; spike medium.

146. Rechberg (Pfitzer).—Dark red, with very dark markings on the lower petals; flowers and spike medium.

98. Ribera (Vilmorin).—Bluish-lilac, shading to vinous-mauve; flowers medium; spike tall.

99. Richard Martin (Kelway).—Carthamus-red; lower petals blotched with creamy-white; flowers medium; spike good.

100. Rock Sand (Kelway).—Fiery-red; flowers medium; spike poor.

101. Rosalind (Burrell).—Rose, splashed with crimson; flowers small; spike good.

203. Rose des Haies (Barr).—Cream, edged with pink; lower petals primrose-yellow; flowers large, being $3\frac{1}{2}$ inches across; spike bold.

102. Safrano (Vilmorin), **A.M.** August 30, 1910.—Amber-yellow, tinged with magenta at the base of the petals, which are waved; flowers and spike medium.

176. Salem (Dobbie).—A Childsii variety of a salmon-pink shade, streaked with orange-red and some white; lower petals unevenly marked with magenta; flowers and spike medium.

147. Sarah Vautier (Pfitzer).—Dark violet, shading lighter at the base of the petals; pale sulphur blotch in the middle of the petals; flowers medium; spike good.

103. Sea Mouse (Kelway).—Pink, mottled with slate-violet; middle lower petal blotched with white; flowers large, borne on a bold spike.

167. Shakespeare (Dobbie).—White, spotted slightly with pale rosy-magenta at the edges; middle lower petal blotched with deep rosy-magenta; flowers medium; spike good.

104. Sibérie (Vilmorin).—Creamy-white, with faint magenta streak on lower petals; flowers large, borne on a good spike; very late flowering.

177. Siboney (Dobbie).—A Childsii variety of a slate-violet colour; lower petals streaked with crimson; flowers medium; spike poor.

105. Sir Marcus Samuel (Kelway).—Salmon-pink; lower petals much streaked with crimson at the base; flowers medium; spike tall.

106. Sir H. D. Wolff (Kelway).—Cherry-red, streaked with purple at the edges; lower petals blotched with cream; flowers and spike medium.

107. Sir Thos. Drew (Kelway).—Carmine, pencilled with dark crimson; base of petals pale yellow, streaked and spotted with crimson; flowers and spike medium.

108. Sir William Ingram (Kelway).—Carthamus-red; lower petals scarlet, blotched with creamy-white; flowers and spike medium.

109. Spiller (Kelway).—A beautiful pale salmon-pink; lower petals creamy-white, streaked with crimson; flowers medium, borne on a tall, bold spike.

110. Sunray (Burrell).—Rose-pink, with crimson markings at the base of the petals, all the petals having streaks of white in the middle; flowers of good size; spike rather short.

168. Sylphide (Dobbie).—Pale rosy-lilac, with a darker blotch on the lower petal; flowers medium; spike good.

219. Taconic (Cowee).—Pale lemon-yellow, with rosy-magenta markings at the base of the petals; a deeper shade of yellow prevails in the lower petals; flowers and spike medium.

204. Thibet (Barr).—Rosy plum-violet; lower petals blotched with dull crimson and white; flowers large; spikes tall and bold.

111. Turenne (Vilmorin).—Deep cerise-pink; lower petals blotched with white; flowers large; spike good; a good decorative variety.

112. Unionist (Kelway).—Bright cerise, splashed with crimson; lower petals blotched with white; flowers medium; spike poor.

113. Utopia (Kelway), **A.M.** August 14, 1894.—Pale cerise-pink, splashed with a little crimson; lower petals having pale yellow markings; flowers medium; spike good.

187. Valmy (Barr).—Salmon-pink; base of lower petals crimson; flowers large; spike medium.

178. Variabilis (Dobbie).—A Childsii variety of a cerise-pink colour, marbled with violet; flowers medium; spike tall.

114. Vesta (Burrell).—Rose, streaked with dull crimson; lower petals marked with creamy-white; flowers medium; spike poor.

216. Victory (Cowee).—Salmon-pink; lower petals blotched with scarlet; flowers large, borne on a tall spike.

115. Viscountess Iveagh (Kelway).—Pale pink; lower petals shading to pale primrose-yellow and streaked with lilac-purple; flowers medium; spike very tall.

116. Warrior (Burrell).—Salmon-pink, splashed with slate-violet; flowers medium; spike good.

117. Warwick Pageant (Kelway).—Vermilion-red; lower petals blotched with white; flowers and spike medium.

205. White Lady (Barr).—Failed to flower.

206. White Queen (Barr).—Pure white; lower petals cream with a slight trace of crimson at the base; flowers medium, borne on a good spike.

118. Wonder (Burrell).—Salmon-pink; lower petals streaked with crimson; flowers small; spike poor.

119. Zephyr (Burrell).—Failed to flower.

120. Zoe (Burrell).—White, shaded with pale rose and streaked with crimson; flowers and spike medium.

MISCELLANEOUS ANNUALS, &c., AT WISLEY, 1910.

ANCHUSA.

capensis atrocoerulea (R. Veitch).—Flowers marine-blue; ⅓ inch diameter; height 2 feet.

capensis 'Blue King' (Barr).—Same as above.

ANTIRRHINUM.

'Art Shades' (J. Veitch).—A good strain, varying from light pink to deep crimson in colour.

'Dwarf Sunset' (Veitch).—A beautiful shade of pink, suffused with orange; very showy and free flowering.

'Extra choice mixed' (Forbes).—A large-flowered strain, ranging from pale yellow to rich crimson in colour.

'Sunset' (Barr).—Rosy-pink, suffused with orange; some of the plants bore deep-crimson flowers.

ASTER (*Callistephus*).

'Branching Crimson' (Boddington).—Flowers large, crimson, borne on stalks considerably over 1 foot long; habit bushy and branching.

'Branching Lavender' (Boddington).—Flowers lavender; habit similar to the above.

'Branching Pink' (Boddington).—Flowers very pale pink; habit same as above.

'Branching Purple' (Boddington).—Flowers rich purple; habit of the plants similar to that of the foregoing.

'Branching Rose' (Boddington).—Flowers bright rose; similar in habit to the preceding varieties.

'Branching Violet' (Boddington).—Flowers of a deep violet-purple colour; habit similar to the above.

'Branching White' (Boddington).—Flowers pure white; habit same as above.

'New Branching Rose' (Boddington).—Flowers rose; plants of similar habit to that of the above.

'New Branching White' (Boddington).—Flowers pure white; habit bushy and branching.

'Cardinal' (Boddington).—Flowers bright crimson and medium in size; 2 feet in height.

'Comet, Lavender Gem' (Boddington).—Flowers lavender, of medium size; height 2 feet.

'Comet, The Favourite' (Boddington).—Flowers pale rosy-pink; 2 feet; erect habit.

'Crego Crimson' (Boddington).—Flowers large, rosy-crimson.

'Crego Lavender' (Boddington).—Flowers lavender, large.

'Crego Light Pink' (Boddington).—Flowers pale pink, large; about 2 feet high.

'Crego Purple' (Boddington).—Flowers deep lavender, large.

'Crego Rose' (Boddington).—Flowers rose; habit similar to the foregoing.

'Crego White' (Boddington).—Flowers white, large.

'Daybreak' (Boddington).—Flowers beautifully formed, pale pink; height 18 inches.

'Daybreak, Improved Yellow' (Boddington).—Flowers pale sulphur-yellow, 3 inches across; height 18 inches; free-branching habit.

'Daybreak, Improved Rose' (Boddington), **XXX** September 15, 1910.—Flowers bright rose, very freely produced, large in size; height 18 inches.

'Daybreak, Improved Salmon' (Boddington), **XXX** September 15, 1910.—Pale salmon-pink flowers; habit similar to the preceding variety.

'Daybreak Pink' (Boddington).—Flowers pale pink, borne on long stalks; size medium.

'Empress Frederic' (Boddington).—Flowers white, 4 inches in diameter; height 1 foot.

'Giant Comet Ruby' (Boddington).—A deep crimson chrysanthemum-like flower of great beauty; dwarf habit.

'Hercules' (Boddington).—Flowers white, 4 inches in diameter, borne in great profusion; height 1 foot.

'Improved Early Branching Temple' (Boddington).—Flowers large, pale pink, borne on stalks about 18 inches long.

'Lavender Daybreak' (Boddington).—Failed to flower.

'Purity' (Boddington).—Flowers large, white; stems stiff, 18 inches long.

'Royal Purple' (Boddington).—Flowers medium in size, purple; plants 2 feet high.

'Snowdrift' (Boddington).—Flowers white, about 4 inches in diameter; plants 1 foot high; very free flowering.

'Sunset' (Boddington).—Flowers large, rose-pink; stems stiff; plants 18 inches high.

'Vick's Mikado' (Boddington).—Flowers light, very full, 4 to 5 inches in diameter; plants 1 foot high.

'Vick's Violet King' (Boddington).—Flowers large, violet-purple, borne on long stems.

CANTERBURY BELL.

'Imperialis' (Barr).—Failed to flower.

CELOSIA.

'New Dwarf Feathered' (Barr).—Failed to flower.

CHRYSANTHEMUM.

'A. Welham' (Welham).—A fine semi-double flower, 3 inches across; florets amber-white, shading to chrome-yellow at the base; plants 18 inches high.

CLARKIA.

'Brilliant' (Barr, Veitch), **XXX** August 23, 1910.—Flowers deep cerise in colour, borne in great numbers on spikes 2½ feet high.

'Pink Pearl' (Barr).—Flowers pale pink, borne on spikes 3 feet in height.

COSMIDIUM.

Burridgeanum 'Orange Crown' (R. Veitch).—Flowers pale orange with brown centre, 1¼ inch in diameter; plants 1 foot in height.

'Orange Crown' (Barr).—Flowers similar in colour to the above, but ¾ inch in diameter and plants about 8 inches tall.

DELPHINIUM.

'Blue Butterfly' (R. Veitch).—A charming annual variety growing about 9 inches tall and bearing flowers of deep marine-blue.

'Extra choice mixed' (Forbes).—Failed to flower.

formosum grandiflorum (Barr).—Flowers large, single, rich gentian-blue with white centre; height 2½ feet.

ultramarinum (Tom Thumb) (Barr).—A charming dwarf variety about 1 foot high, bearing deep marine-blue flowers.

DIANTHUS.

chinensis Heddewigii fl. pl. 'Salmon King' (J. Veitch).—Flowers of good size, varying in colour from pale salmon-pink to deep purple; height 1 foot.

chinensis Heddewigii laciniatus 'Scarlet Queen' (J. Veitch).—Flowers of good size, varying from white to deep crimson.

laciniatus fl. pl. 'Lucifer' (R. Veitch).—Flowers 2 inches in diameter, semi-double, bright carmine; plants about 1 foot high.

'Lucifer' (Barr).—Similar to the preceding.

DIMORPHOTHECA.

aurantiaca (Barr, R. Veitch), **A.M.** May 26, 1908.—A half-hardy annual from South Africa; flowers daisy-like, 3 inches in diameter, rich orange with a narrow deep-purple band surrounding the blackish-purple disc; leaves fleshy, oblong, toothed; height 1 foot.

ESCHSCHOLZIA.

Thorburnii (R. Veitch).—Flowers bright orange-cadmium; large, being 3½ inches across when fully open.

GAILLARDIA.

hybrida grandiflora (R. Veitch).—Good strong plants were raised, but no flowers were produced up to the time of drawing up the report.

GILIA.

coronopifolia (R. Veitch). **A.M.** August 28, 1906.—A half-hardy biennial from South Carolina, bearing brilliant scarlet tubular flowers about 1 to 1½ inch long; the leaves are very finely divided, and have a feathery appearance; height 3 to 4 feet.

dichotoma (Veitch).—Flowers pure white, 1¼ inch across; leaves opposite, palmately cleft; plant erect, 6 to 12 inches high.

GODETIA.

'Crimson Glow' (R. Veitch).—Flowers purplish-red, with the base of the petals white; 2½ inches in diameter; height 1 foot; very free-flowering.

GYPSOPHILA.

'Rosy Gem' (Barr).—A very useful annual, bearing large quantities of pale carmine flowers ½ inch in diameter; stems much branched and very sticky; height 1 to 1½ foot.

HELIANTHUS.

'New Double Lemon Queen' (Barr).—Flowers buttercup-yellow, about 7 inches in diameter; height 4 feet.

LARKSPUR.

'Barr's Rosy Scarlet' (Barr).—Flowers rosy-pink, borne in great profusion; height 2½ feet.

'Tom Thumb Rose' (R. Veitch).—Produces large dense heads of double, pale lilac-rose flowers 1¼ inch across; branching; 16 inches high.

LOBELIA.

(Thornycroft).—A new dwarf variety about 6 inches high, bearing violet-purple flowers which have two white marks on the middle lower petal.

MARIGOLD.

'African lemon' (Forbes).—Flowers large, double, lemon-yellow.

'African orange' (Forbes).—Similar to the preceding, except in the colour, which is bright orange.

'French gold-striped' (Forbes).—Flowers 3 inches across, varying in colour from pale lemon-yellow to deep orange; height 3 feet.

MIGNONETTE.

'Diamond' (R. Veitch).—Spikes of flower medium in size; habit rather spreading.

'Gabriele' (R. Veitch).—A good free-flowering variety, 14 inches in height and very sweetly scented.

'Goliath' (R. Veitch).—A dwarf, compact variety, very free-flowering in habit.

'Machet' (R. Veitch).—A dwarf variety, producing good spikes of flower in abundance.

'Ruby' (R. Veitch).—A dwarf variety having very dark-coloured flowers; sweetly scented.

'Victoria Perfecta' (R. Veitch).—A very fine variety producing long spikes of flower in great profusion.

MYOSOTIS.

'Alpine Blue' (Barr).—A very fine variety, forming dwarf bushy plants covered with intense blue flowers; height 9 inches.

'Royal Blue' (R. Veitch).—A useful variety, not unlike the preceding.

NASTURTIUM.

'Empress of India' (R. Veitch).—A dwarf, compact-growing variety with very bright scarlet-orange flowers measuring 2½ inches across; the two upper petals are delicately marked with dark lines; habit very free-flowering.

'Queen of Tom Thumbs' (R. Veitch).—Flowers varying in colour from orange-red to dull carmine-red; plants about 6 inches high; 83 per cent. of the plants had variegated foliage.

NEMESIA.

'New Dwarf Fire King' (Barr).—Flowers ranging from vermilion to deep orange-scarlet; plants bushy in habit and about 1 foot high.

strumosa 'Orange Prince' (Barr).—Flower large, mostly deep carmine-red, having the base of the lower lip orange spotted with black; height 9 inches.

NIGELLA.

'Miss Jekyll Improved' (Barr).—Flowers large, cornflower-blue, borne on long stems; height 18 inches.

PANSY.

'Extra choice mixed' (Forbes).—A good strain of "fancy" pansies, ranging in colour from yellow to violet. Some of the blooms were of exceptionally large size.

PENTSTEMON.

Forbes' Hybrids (Forbes).—Good, strong plants were raised, but no flower had been produced up to the time of drawing up the report.

PETUNIA.

grandiflora 'Veitch's strain' (R. Veitch):—A good strain, producing large flowers ranging in colour from pure white to deep crimson and purple.

PHLOX.

'Crimson Gem' (Barr).—Flowers carmine-red, ¾ inch in diameter, with dark centre; height 6 inches.

Drummondii hortensiaeflora 'Salmon Beauty' (Barr).—Similar in habit and size to the preceding, but of a very pleasing salmon-pink colour.

POPPY.

Iceland, 'New Art Shades' (Barr).—A good strain, giving some beautiful colours, conspicuous among which were scarlet-orange, sulphur-white, and cadmium-yellow.

SALVIA.

patens nana compacta (R. Veitch).—Flowers Prussian blue, borne in great profusion, large; plants about 2 feet tall.

patens 'New early dwarf' (Barr).—Practically the same as the preceding.

splendens 'Fire Ball' (Barr).—Flowers vermilion-scarlet, held well above the foliage; height 1½ foot; an early and very free-flowering variety.

splendens 'Lord Fauntleroy' (R. Veitch).—Flowers russet-orange, very freely produced; height 1 to 1½ foot.

STOCK.

'Dwarf Crimson Gem' (Barr).—Flowers fuchsin-red or lilac-purple; sweetly scented; height 1 foot; the strain produced both double and single flowers.

East Lothian, Crimson (Forbes).—Flowers bright crimson, semi-double; foliage glaucous.

East Lothian, Crimson Wallflower-leaved (Forbes).—Flowers crimson, semi-double, slightly scented; foliage bright green.

East Lothian, Purple (Forbes).—Flowers violet-purple, double; foliage glaucous.

East Lothian, Rose (Forbes).—Flowers rosy-pink, semi-double; leaves glaucous.

East Lothian, 'Snowdrift' (Barr).—Flowers white, large, double, strongly scented; foliage glaucous; habit dwarf and bushy.

East Lothian, White (Forbes).—Flowers white; foliage glaucous; flower spikes very full.

East Lothian, White Wallflower-leaved (Forbes).—Flowers white, double; foliage bright green.

Scarlet Brompton (R. Veitch).—Flowers crimson; foliage large and healthy.

SWEET WILLIAM.

'Scarlet Beauty' (Barr).—Flowers mostly rose-scarlet; very free-flowering; height 1½ foot.

TAGETES.

patula nana fl. pl. 'Aurora' (R. Veitch).—A useful bedding variety, comprising various shades of yellow, orange, and dull red; height 6 inches.

VALERIANELLA.

congesta (R. Veitch).—Produces medium-sized heads of Solferino-red flowers.

'New Giant Rose Queen' (Barr).—Failed to flower.

VIOLA.

'Extra choice mixed' (Forbes).—Flowers of large size, ranging in colour from yellow to rosy-purple.

PEAS AT WISLEY, 1910.

Two hundred and sixty-four stocks of peas were received for trial The early varieties were sown on March 14, the second early varieties on April 4, and the maincrop varieties on May 4. In the great majority of cases the germination was very good, and the stocks grew and cropped so well that the Committee wished it to be recorded that they considered the trial excellent. The ground on which the peas were grown had not only been deeply dug and liberally manured, but a mulching of strawy manure was applied when they came into blossom, thus feeding the roots and economizing moisture at the same time. The Committee examined the stocks on four occasions. The varieties numbered as follows were selected as the best on the respective dates, and were submitted to the full Committee:—

June 30.—Nos. 12, 14, 38, 39, 45, 62, 64, 71.

July 26.—Nos. 103, 105, 109, 110, 113, 114, 122, 126, 142, 158.

August 11.—Nos. 138, 140, 141, 142, 150, 154, 155, 156, 158, 163, 189, 191, 196, 201, 202.

September.—No. 230.

In accordance with notices in the Society's publications and in the Horticultural Press, Pea trials after 1910 are to be conducted on a new plan, for it has been pointed out that it is not fair to compare, and to adjudicate on the merits of, varieties of Peas sown on different dates; but that all peas sent for trial ought to be sown on one and the same day. The Council considered, however, that it would not be quite fair on an admittedly late pea to sow it on the same day as an admittedly early one. It has, therefore, been decided to ask for one pint of seed peas and divide it into three parts, and make sowings of all varieties on three different dates suiting Early, Mid-season, and Late Peas, as in this way only can the two difficulties be overcome. This new system was not in operation when the following Peas underwent trial:—

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

Varieties.

*1. Abundance.
2. Advancement.
3. } American Wonder.
4. }
5. Acme.
6. Bedfordian.
7. } Bountiful.
8. }
9. } Chelsea Gem.
10. }
11. Daffodil.
12. Dawn.
13. Daylight.
14. Duchess of York.
15. Dwarf Favourite.
16. Earliest Marrow.

* See footnote p. 672.

17. Early Dwarf.
18. Early Giant.
19. Early Morn.
20. Early Sunrise.
21. Eclipse.
22. Edward VII.
23. Eight Weeks.
24. Empress of India.
25. English Wonder.
26. English Wonder (selected).
27. 28. Excelsior.
29. Express.
30. First of All.
31. Giant Express.
32. 33. Giant Lightning.
34. 35. Gradus.
36. 37. Green Gem.
38. Harbinger.
39. Hundredfold.
40. 41. Ideal.
42. King Edward VII.
43. King of Dwarfs.
44. Laxtonian.
45. Laxtonian (re-selected).
46. 47. Lightning.
48. 49. 50. Little Marvel.
51. 52. Mayflower.
53. 54. May Queen.
55. Paris Market.
56. Pilot (re-selected).
57. Pioneer.
58. Profit.
59. Reading Wonder.
60. Sangster's No. 1.
61. Seedling Marrowfat.
62. Early Duke.
63. Seedling.
64. Snowdrop.
65. Springtide.
66. Ten Weeks.
67. The Feltham.
68. The Herald.
69. The Pilot.
70. Thomas Laxton.
71. Victor.
72. Western Express.
73. 74. William Hurst.
75. William the First.
76. Witham Wonder.
77. World's Record.
78. Abundance.
79. Boston Unrivalled.
80. Centenary.
81. Centenary Marrowfat.
82. The Clipper (improved).
83. Criterion.
84. Daisy.
85. Discovery.
86. Duke of Albany.
87. 88. 89. Duke of York.
90. 91. Dwarf Defiance.
92. 93. Edwin Beckett.
94. Evergreen Delicatesse.
95. Exhibition Marrow.
96. Favourite Marrowfat.
97. Fillbasket.
98. Gladiator.
99. Golden King.
100. Incomparable.
101. King Edward.
102. Lord Roberts.
103. Prestige.
104. Pride of the Market.
105. Prince of Peas.
106. Prince of Wales.
107. Prize Winner.
108. Seedling No. 209.
109. Stratagem.
110. Superlative.
111 112. Telegraph.
113. 114. Telephone.

115. Torpedo.
116. Commonwealth.
117. Dreadnought.
118. Earliana.
119. Imperialist.
120. King's Favourite.
121. King's Success.
122. Moneymaker.
123. Mural Gem.
124. Superlative.
125. The Birchfield.
126. Alderman.
127. Alderman (selected).
128. 129. Battleship.
130. 131. Best of All.
132. British Queen.
133. Buttercup.
134. Commonwealth.
135. Commonwealth (re-selected).
136. Councillor.
137. Daisy.
138. Daisy, Early.
139. Danby Stratagem.
140. Delicatesse.
141. Dr. McLean (re-selected).
142. Duke of Albany (re-selected).
143. Dwarf Monarch.
144. Duke of Albany (selected).
145. Duke of Albany.
146. Emerald Queen.
147. 148. Eureka.
149. Evergreen Delicatesse.
150. 151. Exhibition.
152. Fillbasket.
153. Gladstone (selected).
154. 155. 156. Glory of Devon.
157. Harvestman.
158. International.
159. Invincible.
160. King of the Marrow.
161. Leviathan.
162. Magnificent.
163. 164. Magnum Bonum.
165. 166. Maincrop.
167. Majestic.
168. Market Favourite.
169. Mars.
170. Masterpiece.
171. Matchless Marrowfat.
172. Model Daisy.
173. Model Telegraph.
174. Model Telephone.
175. Ne Plus Ultra (selected).
176. New Telegraph.
177. Omega (improved).
178. P. C. Palmer.
179. 180. Peerless.
181. Perfection Marrowfat.
182. Prince of Wales.
183. Prince of Wales (improved).
184. Prize Winner.
185. Prodigy.
186. Prolific Marrow.
187. 188. Quite Content.
189. Royal Jubilee.
190. Royal Standard.
191. Satisfaction.
192. Sharpe's Standard.
193. Sharpe's Queen.
194. 195. Stratagem.
196. Stratagem (re-selected).
197. Superlative.
198. The Bell.
199. 200. Veitch's Perfection.
201. Windsor Castle.
202. Yorkshire Hero.
203. Zenith.
204. Seedling 229.
205. Edible Pea (coloured flower).
206. Leicester Hero.
207. Saxonia.
208. Anticipation.
209. 210. Autocrat.
211. Absolute.
212. 213. Captain Cuttle.
214. Continuity.

215. Dreadnought.
216. French Sugar.
217. Gladstone.
218. Gladstone (selected).
219. Goldfinder.
220. Giant.
221. } Late Queen.
222. }
223. Michaelmas.
224. } Ne Plus Ultra.
225. }
226. Omega.
227. Queen.
228. Rearguard.
229. Veitch's Perfection.
230. Seedling 223.
231. Seedling 231.
232. Early Bird.
233. Favourite.
234. Gledfield.
235. Leader.
236. Rosskeen.
237. Rosemant.
238. The Marquis.
239. Tarlogie.
240. The Skipper.
241. The Cropper.
242. } Andrew Carnegie.
243. }
244. Balnagown.
245. Cadbown.
246. Craig Holmes.
247. Fairburn.
248. Glenshire.
249. Lochalsh.
250. Mansfield.
251. Mark Twain.
252. Novan.
253. } Strathpeffer.
254. }
255. Skibo.
256. Seedling No. 19.
257. Seedling No. 80.
258. Seedling No. 6.
259. The Count.
260. The Cromarty.
261. The Duke.
262. The Dornoch.
263. The Ross-shire.
264. The Tarbat.

Early Peas.

Sown March 14.

1. Abundance (Sutton).—Height 18 inches; haulm strong and very dark green; pods usually single, dark green, and of a very good size; seeds wrinkled; six large peas in a pod.

2. Advancement (Carter).—For description see vol. xxxiv., p. 288.

3. American Wonder (Carter).—Height 12-15 inches; haulm dark green; pods usually single, well filled, 3½ inches long, pale green; five large peas in pod; seeds wrinkled.

4. American Wonder (Sutton).—Height 6-12 inches; haulm very dark green and strong; pods usually in pairs, 2½ inches long, containing four large peas, as a rule; seeds wrinkled.

5. Acme (J. Veitch), **A.M.** July 5, 1898.—Height 4½ feet; haulm rather thin and light green; pods dark green, 3 inches long and in pairs, with six large peas in a pod; seeds wrinkled.

6. Bedfordian (Laxton).—Height 18 inches; haulm and pods very dark green; pods usually single, 3½-4 inches in length, averaging eight large peas in a pod; seeds wrinkled.

7, 8. Bountiful (Sutton, Barr).—Height 5 feet; haulm light green and strong; pods light green, 3½ inches long, averaging six large peas in each pod; seeds round.

9, 10. Chelsea Gem (Sutton, J. Veitch), **F.C.C.** July 1, 1887.—Height 12 inches; haulm dark green and strong; pods usually in pairs,

pale green, 2 inches in length, with six good-sized peas in each pod, seeds wrinkled.

11. Daffodil (Carter), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 288.

12. Dawn (Carter), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 288.

13. Daylight (Carter).—Height 3 feet; haulm pale straw colour, with moderate growth; pods single, 3-3½ inches in length, with six or seven large peas in a pod; seeds wrinkled.

14. Duchess of York (Sutton), **A.M.** June 20, 1901.—Height 4½ feet; haulm and pods dark green; haulm very strong; pods in pairs, 3½ inches in length, with usually six very large peas in each; seeds wrinkled. A heavy crop.

15. Dwarf Favourite (Carter).—Height 12-15 inches; haulm dark green, strong; pods dark green, usually in pairs, 3-3½ inches in length, with six good-sized peas in each pod on an average; seeds wrinkled.

16. Earliest Marrow (J. Veitch).—Height 3½ feet; haulm dark green and strong; pods dark green, single, 3½ inches long, averaging eight large peas in each pod; seeds wrinkled.

*232. Early Bird (Holmes).—Height 2½ feet; haulm dark green, but rather thin; pods single, 2½-3 inches long, averaging six large dark green peas in a pod; pods straight; seeds round.

62. Early Duke (Carter), **A.M.** June 30, 1910.—Height 3½ feet; haulm and pods dark green; pods usually single, 3 inches long, with five large peas in a pod; seeds wrinkled. Raised from Express × Duke of Albany.

17. Early Dwarf (Sutton).—Height 15-18 inches; haulm sturdy and dark green; pods dark, usually single, 3 inches in length, with four large peas in a pod; seeds wrinkled.

18. Early Giant (Sutton), **A.M.** July 11, 1902.—4½ feet in height; haulm light green and strong; pods single, 3½-4 inches in length, with seven very large peas in each pod; seeds wrinkled.

19. Early Morn (Carter).—For description see vol. xxxiv., p. 288.

20. Early Sunrise (Sutton).—Height 3 feet; haulm dark green, sturdy; pods dark green, in pairs, 3½ inches long, with four or five peas in each pod, seeds wrinkled.

21. Eclipse (Carter).—For description see vol. xxxiv., p. 288.

22. Edward VII. (Barr), **A.M.** June 20, 1901.—Height 2 feet; haulm dark green and sturdy; pods dark green, in pairs, 4 inches long, with eight good-sized peas in a pod; seeds wrinkled.

23. Eight Weeks (Carter).—Height 15-18 inches; haulm sturdy and dark green; pods in pairs, 2½ inches long, containing on an average six good-sized peas in each pod; seeds round.

24. Empress of India (Sutton).—Height 3½ feet; haulm sturdy and dark green; pods single, dark green, 3½-4 inches in length, containing seven large peas in a pod; seeds wrinkled.

*** Varieties distinguished by an asterisk were sent in and sown late.**

25. English Wonder (Sutton).—Height 15-18 inches; haulm dark green and sturdy; pods dark green, in pairs, 3 inches long, with five large peas in a pod; seeds wrinkled.

26. English Wonder (selected) (Dobbie).—Same as No. 25.

27. Excelsior (Barr).—Height 2 feet; haulm dark green and strong; pods dark green, usually in pairs, 3½ inches long, averaging six large peas in a pod; seeds wrinkled.

28. Excelsior (Sutton), **A.M.** July 14, 1905.—Height 18 inches; haulm and pods dark green; pods usually single, 2½ inches long, with five large peas in a pod; seeds wrinkled.

29. Express (Carter).—Height 4 feet; haulm strong and light green; pods light green, in pairs, 2½ inches long, averaging six small peas in a pod; seeds round.

*233. Favourite (Holmes).—Height 4½ feet; haulm and pods dark green; pods in pairs, 4-4½ inches long, curved; seeds wrinkled.

30. First of All (Sutton).—Height 3½ feet; haulm light green, strong; pods single, light green, 3 inches in length, with seven good-sized peas in each pod; seeds wrinkled.

31. Giant Express (Carter).—Height 4½ feet; haulm light green and strong; pods light green, single, 3½ inches in length, averaging eight large peas in a pod; seeds round.

32, 33. Giant Lightning (Carter, Barr).—Height 4½ feet; haulm dark green and strong; pods dark green, in pairs, 3 inches long, averaging six large peas in each pod; seeds round.

*234. Gledfield (Holmes).—Height 4 feet; haulm light green; pods dark green, single, 4-4½ inches long, with seven or eight dark green peas; pods straight; seeds wrinkled.

34. Gradus (Barr), **F.C.C.** July 1, 1887.—Height 4½ feet; haulm strong and light green; pods light green, usually in pairs, 3 inches in length, averaging five large peas in a pod; seeds wrinkled.

35. Gradus (J. Veitch).—A fine stock.

36, 37. Green Gem (Sutton, Barr), **A.M.** July 4, 1905.—Height 12-15 inches; haulm very dark green and robust; pods 2-2½ inches in length, mostly single, averaging four rather small peas in each pod; seeds wrinkled.

38. Harbinger (Sutton), **F.C.C.** 1872.—Height 6-9 inches; haulm dark green, but rather thin; pods usually single, 2 inches long, having from four to six peas in a pod; seeds wrinkled.

39. Hundredfold (Sutton), **A.M.** June 30, 1910.—Height 2 feet; haulm very dark green and sturdy; pods dark green, in pairs, 3-3½ inches in length, with usually four good-sized peas in each; seeds wrinkled.

40. Ideal (Sutton), **A.M.** June 20, 1901.—Height 3½ feet; haulm dark green, but rather thin; pods dark green, single, 3½ inches long, averaging six large peas in a pod; seeds wrinkled.

41. Ideal (Barr).—Failed entirely.

42. King Edward VII. (Carter).—Height 4 feet; haulm and pods dark green; pods usually single, 3 inches long, with four large peas in a pod; seeds wrinkled.

43. King of Dwarfs (Sutton).—Height 6 inches; haulm light green but weak; pods dark green, single, 2 inches in length, averaging five large peas in a pod; seeds wrinkled.

44. Laxtonian (Nutting).—Height 12 inches; haulm very dark green and rather thin; pods dark green, usually in pairs, 3-3½ inches in length, averaging five large peas in a pod; seeds wrinkled.

45. Laxtonian (Carter), **A.M.** June 30, 1910.—A more vigorous form of No. 44.

*235. Leader (Holmes).—Height 5 feet; haulm and pods dark green; haulm strong; pods in pairs, 3½-4 inches long, with six or seven good-sized dark green peas; seeds round.

46, 47. Lightning (Carter, Barr).—For description see vol. xxxiv., p. 289.

48, 49, 50. Little Marvel (Carter, Sutton, Barr). **A.M.** July 3, 1903.—Height 2 feet; haulm very dark green and strong; pods in pairs, 2-2½ inches in length, with four good-sized peas in a pod; seeds wrinkled.

51, 52. Mayflower (Barr, Carter).—For description see vol xxxiv., p. 289.

53, 54. May Queen (Sutton, Barr).—Height 3½ feet; haulm light green and rather thin; pods light green, single, 3¼ inches long, containing seven or eight very large peas in each pod; seeds wrinkled.

55. Paris Market (Carter).—Height 3½ feet; haulm light green and rather thin; pods usually single, light green, 2½-3 inches long, with six good-sized peas in a pod; seeds wrinkled.

56. Pilot, re-selected (Carter).— For description see vol. xxxiv., p. 289.

57. Pioneer (Sutton).—Height 15-18 inches; haulm strong and dark green; pods dark green, mostly in pairs, 3½ inches long, averaging six large peas in a pod; seeds wrinkled.

58. Profit (Laxton).—Height 2½ feet; haulm and pods dark green; strong grower; pods in pairs, 3½ inches long, averaging six large peas in a pod; seeds wrinkled.

59. Reading Wonder (Sutton).—Height 6-9 inches; haulm dark green, but rather thin; pods in pairs, well filled, 3 inches in length, averaging five large peas in a pod; seeds wrinkled.

*237. Rosemant (Holmes).—Height 18 inches; haulm dark green and strong; pods dark green, mostly in pairs, 3 inches long, averaging seven good-sized dark green peas; pods straight; seeds round.

*236. Rosskeen (Holmes).—Height 3 feet; haulm dark green, but rather thin; pods dark green, single, 3-3½ inches long, averaging eight large dark green peas; pods curved; seeds wrinkled; germination poor.

60. Sangster's No. 1 (Sutton).—Height 3½ feet; haulm dark green, but rather thin; pods in pairs, 2½ inches long, with six rather small peas in each pod; seeds round.

61. Seedling Marrowfat (Sutton).—Height 9-12 inches; haulm sturdy, very dark green; pods very dark green, in pairs, 2½-3 inches long, averaging four very large peas in a pod; seeds wrinkled.

63. Seedling (N. Booth).—Height 15-18 inches; haulm sturdy and dark green; pods dark green, in pairs, 3 inches long, averaging six large peas in a pod; seeds wrinkled.

64. Snowdrop (Carter), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 290.

65. Springtide (Carter).—Height 4 feet; haulm and pods light green; pods single, 3-3½ inches in length, averaging eight good-sized peas in each pod; seeds wrinkled.

*239. Tarlogie (Holmes).—Height 3 feet; haulm weak, dark green; pods dark green, single, 3½-4 inches long, with nine or ten large peas; pods curved; seeds wrinkled; germination poor.

66. Ten Weeks (Laxton).— Height 3½ feet; haulm dark green and strong; pods usually single, 3½ inches long, averaging six large peas in a pod; seeds wrinkled.

*241. The Cropper (Holmes).—Height 4½ feet; haulm strong and dark green; pods mostly in pairs, dark green, 3½-4 inches long, with six or seven large peas in a pod; pods straight; seeds wrinkled.

67. The Feltham (J. Veitch).—Height 2 feet; haulm and pods very dark green; pods dark green, mostly in pairs, 3-3½ inches long, averaging four large peas in a pod; seeds wrinkled.

68. The Herald (Barr).—Height 2 feet; haulm sturdy and very dark green; pods very dark green, in pairs, 3½ inches long, with five very large peas; seeds wrinkled.

*238. The Marquis (Holmes).—Height 3 feet; haulm and pods dark green; pods single, 3½ inches long, with six or seven good-sized dark green peas; pods curved; seeds wrinkled; germination poor.

69. The Pilot (Sutton), **A.M.** July 3, 1903.—Height 4 feet; haulm strong and dark green; pods dark green, usually in pairs, 3 inches long, averaging five good-sized peas in a pod; seeds wrinkled.

*240. The Skipper (Holmes).—Height 4 feet; haulm strong, dark green; pods single, 3½-4 inches long, averaging eight large dark green peas in a pod; pods curved; seeds round; germination poor.

70. Thomas Laxton (Sutton), **A.M.** July 5, 1898.—Height 4 feet; haulm and pods dark green; pods in pairs, 3½ inches long, with about eight nice-sized peas in each pod; seeds wrinkled.

71. Victor (J. Veitch), **A.M.** June 30, 1910.—Height 15 inches; haulm light green and sturdy; pods dark green, in pairs, 3-4 inches long, containing six to eight large peas in a pod; seeds wrinkled; considered by the Committee to be a very desirable variety for frame or pot cultivation.

72. Western Express (R. Veitch), **A.M.** July 11, 1902.—Height 4 feet; haulm sturdy and light green; pods dark green, in pairs, 3½ inches long, containing five or six large peas in a pod; seeds wrinkled.

73, 74. William Hurst (Barr, Sutton).—For description see vol. xxxiv., p. 289.

75. William the First (Barr), **F.C.C.** 1872.—Height 4-5 feet; haulm and pods light green; pods in pairs, light green, 3½ inches long, averaging seven large peas in a pod; seeds round.

76. Witham Wonder (Barr).—Height 18 inches; haulm dark green and rather thin; pods in pairs, 3 inches long, averaging seven small peas in a pod; seeds wrinkled.

77. World's Record (Sutton).—Height 3 feet; haulm and pods dark green; pods single, 3½ inches long, averaging six large peas in a pod; seeds wrinkled; germination bad.

Second Early Peas.

Sown April 4.

78. Abundance (Barr).—See p. 711.

79. Boston Unrivalled (Barr), **A.M.** July 14, 1896.—For description see vol. xxxiv., p. 289.

80. Centenary (Barr), **A.M.** July 5, 1901.—Height 5½ feet; haulm strong and dark green; pods dark green, single, 4-4½ inches in length, averaging eight large dark green peas in a pod; seeds wrinkled.

81. Centenary Marrowfat (Sutton).—Height 5½ feet; haulm and pods light green; pods single, 4½ inches long, with eight or nine large light green sweet peas in a pod; pods curved; seeds wrinkled; good crop.

*116. Commonwealth (J. K. King).—For description see vol. xxxiv., p. 289.

83. Criterion (J. Veitch).—Height 5 feet; haulm light green and strong; pods light green, single, 3 inches in length, averaging eight good-sized dark green wrinkled peas in a pod; pods straight.

84. Daisy (Barr), **F.C.C.** July 11, 1902.—For description see vol. xxvi., p. 227.

85. Discovery (Sutton).—Height 2½-3 feet; haulm very dark green and strong; pods mostly in pairs, 4-5 inches long, averaging eight dark green peas in a pod; seeds wrinkled.

*117. Dreadnought (J. K. King).—For description see vol. xxxiv., p. 290.

86. Duke of Albany (Barr), **A.M.** July 5, 1901. For description see vol. xxix., p. 681.

87, 88, 89. Duke of York (Carter, Barr, Sutton), **A.M.** June 6, 1893.—Height 3½-4 feet; haulm light green and strong; pods light green, in pairs, 3-3½ inches long, with seven or eight large dark green peas in a pod; pods straight; seeds wrinkled.

90, 91. Dwarf Defiance (Sutton, Barr), **A.M.** July 5, 1901.—Height 2-2½ feet; haulm very dark green and strong; pods usually single, 4-5 inches long, averaging ten large dark green peas in pod; pods straight; seeds wrinkled.

*118. Earliana (J. K. King).—Height 2½ feet; haulm light green and rather thin; pods single and very small, averaging six very small peas; seeds round.

92, 93. Edwin Beckett (Carter, Barr), **F.C.C.** July 3, 1900.—Height 4 feet; haulm light green, very strong growth; pods single, dark green, 3½-4 inches long, with eight or nine large light green peas in a pod; pods curved; seeds wrinkled.

94. Evergreen Delicatesse (Barr), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 289.

95. Exhibition Marrow (J. Veitch).—Height 2½ feet; haulm very dark green, sturdy, pods mostly in pairs, dark green, 4-4½ inches long, averaging eight very large peas in a pod; seeds wrinkled.

96. Favourite Marrowfat (Sutton).—Height 2 feet; haulm dark green, strong; pods mostly in pairs, 2½-3 inches long, with seven or eight large peas in a pod; seeds wrinkled.

97. Fillbasket (Barr), **F.C.C.** 1872.—Height 3½ feet; haulm very dark green and sturdy, pods in pairs, 3 inches long, averaging eight good-sized peas in a pod; pods dark green; seeds round.

98. Gladiator (Barr), **F.C.C.** July 7, 1882.—Height 3 feet; haulm and pods dark green; pods mostly single, 3½-4 inches in length, with seven or eight large peas in a pod; pods curved; seeds round.

99. Golden King (Barr).—Height 4½ feet; haulm light green, strong; pods light green, usually single, 3½-4 inches long, averaging eight very large white peas in a pod; good crop; seeds wrinkled.

*119. Imperialist (J. K. King).—Hardly germinated.

100. Incomparable (Sutton).—Height 2½ feet; haulm and pods very dark green; pods single, 4-4½ inches long, averaging seven large peas in a pod; pods straight; seeds wrinkled.

101. King Edward (Sutton).—Height 2½ feet; haulm very dark green and sturdy; pods in pairs, 4 inches long, with six or eight very large dark green peas in a pod; pods straight; seeds wrinkled.

*120. King's Favourite (J. K. King).—Height 3½ feet; haulm strong and dark green; pods mostly in pairs, light green, 3½ inches long, averaging eight large light green peas; pods curved; seeds wrinkled.

*121. King's Success (J. K. King).—Height 2 feet; haulm and pods dark green; pods mostly single, 4 inches long, with seven or eight good-sized peas in a pod; pods straight; seeds wrinkled; germination poor.

102. Lord Roberts (Sutton), **A.M.** July 18, 1902.—Height 2½ feet; haulm and pods dark green; pods in pairs, 4 inches long, with seven or eight large sweet peas in a pod; pods straight; seeds wrinkled.

*122. Moneymaker (J. K. King), **A.M.** August 2, 1910.—Height 5½ feet; haulm dark green, sturdy; pods dark green, mostly in pairs, 4-4½ inches long, averaging eight good-sized sweet dark green peas in a pod; pods curved; splendid crop; seeds wrinkled.

*123. Mural Gem (J. K. King).—Hardly germinated.

103. Prestige (J. Veitch), **A.M.** August 2, 1910.—Height 3½ feet; haulm dark green, sturdy; pods in pairs, dark green, 4-4½ inches long, averaging eight large sweet dark green peas in a pod; pods straight; good crop; seeds wrinkled.

104. Pride of the Market (Barr), **F.C.C.** July 22, 1881.—Height 2½ feet; haulm and pods dark green; pods mostly in pairs, 4 inches long, averaging seven large peas in a pod; pods straight; very good crop; seeds round.

105. Prince of Peas (Sutton), **A.M.** August 2, 1910.—Height 5½ feet; haulm dark green with very strong growth; pods dark green,

mostly single, 3½-4 inches in length, with seven to nine large sweet peas in a pod; pods straight; seeds wrinkled.

106. Prince of Wales (Sutton).—Height 3½ feet; haulm very dark green, strong; pods dark green, in pairs, 3-3½ inches long, with six or seven large peas in a pod; pods straight; seeds wrinkled.

107. Prizewinner (Sutton), **F.C.C.** July 5, 1901.—Height 3 feet; haulm very dark green and strong; pods very dark green, usually single, 4-4½ inches long, averaging seven good-sized sweet peas in a pod; pods straight; seeds wrinkled.

108. Seedling 209 (Carter).—Height 5½ feet; haulm and pods dark green; pods mostly single, 3-4 inches long, averaging nine large dark green peas in a pod; pods curved; seeds wrinkled.

109. Stratagem (Sutton), **F.C.C.** August 14, 1879.—Height 2½ feet; haulm sturdy and very dark green; pods very dark green, in pairs, 3-4 inches long, with eight or nine dark green peas in a pod; seeds wrinkled.

110, 124, 197. Superlative (Dobbie, Sydenham, Sutton), **F.C.C.** 1872.—Height 3½ feet; haulm and pods very dark green; pods mostly in pairs, 4½ inches long, averaging nine very large dark green sweet peas in a pod; seeds wrinkled; heavy crop.

111. Telegraph (Sutton).—Height 5½ feet; haulm and pods dark green; haulm strong; pods mostly single, 3-3½ inches long, averaging eight good-sized peas in a pod; pods curved; seeds round.

112. Telegraph (Barr).—Very similar to No. 111.

113, 114. Telephone (Sutton, Barr), **F.C.C.** June 27, 1878.—For description see vol. xxix., p. 686.

*125. The Birchfield (J. Jones).—Height 3 feet; haulm and pods very dark green; haulm strong; pods mostly single, 4-4½ inches long, averaging eight good-sized dark green peas; pods straight; seeds wrinkled.

82. The Clipper (improved) (Sydenham).—Height 5 feet; haulm dark green and strong; pods mostly single, straight, dark green, 4-4½ inches long, with eight or nine large sweet light green peas in each pod; seeds wrinkled.

115. Torpedo (Carter).—Height 4 feet; haulm light green and strong; pods single, dark green, 3-3½ inches long, averaging seven large peas in a pod; peas dark green and wrinkled.

Maincrop.

Sown May 4.

126. Alderman (Barr).—Height 6 feet; haulm and pods dark green; haulm strong; pods mostly single, 4-5 inches long, averaging nine large peas in a pod; pods straight; heavy crop; seeds wrinkled.

127. Alderman (selected) (Dobbie), **F.C.C.** July 10, 1900.—Height 5½ feet; haulm sturdy and dark green; pods dark green, single, 4-5 inches in length, averaging eight large dark green peas; pods straight; seeds wrinkled.

242. Andrew Carnegie = Nonsuch × Quite Content (Holmes).—Height 5-6 feet; haulm and pods dark green; pods single, 4½-5 inches long, averaging ten large peas in a pod; pods straight; seeds wrinkled.

243. Andrew Carnegie = Quite Content × Seedling (Holmes).—Height 5 feet; haulm and pods dark green; haulm strong; pods single, 4-4½ inches long, averaging eight large peas in a pod; pods straight; seeds wrinkled.

244. Balnagown (Holmes).—Height 6 feet; haulm strong and dark green; pods mostly single, 4-5 inches long, averaging eight large dark green peas in a pod; pods straight; seeds wrinkled.

128, 129. Battleship (Carter, Barr).—Height 6 feet; haulm dark green, but rather thin; pods dark green, mostly in pairs, 3½-4 inches long, averaging eight large dark green peas; pods straight; seeds wrinkled; good crop.

130, 131. Best of All (Sutton, Barr).—Height 3½-4 feet; haulm dark green and strong; pods dark green, usually in pairs, 4-4½ inches long, with eight to ten large dark green peas; pods straight; seeds wrinkled.

132. British Queen (Barr).—Height 6½ feet; haulm dark green and sturdy; pods dark green, 2½ inches long, averaging six good-sized light green peas in a pod; pods straight; seeds wrinkled.

133. Buttercup (Carter).—For description see vol. xxxiv., p. 289.

245. Cadbown (Holmes).—Height 4-5 feet; haulm and pods dark green; haulm strong; pods single, 4-4½ inches long, averaging seven large dark green peas in a pod; pods straight; seeds wrinkled.

134. Commonwealth (Carter).—For description see vol. xxxiv., p. 289.

135. Commonwealth (re-selected) (Carter).—For description see vol. xxxiv., p. 289.

136. Councillor (Laxton).—Height 2 feet; haulm and pods very dark green; haulm sturdy; pods mostly single, 4-4½ inches long, with eight or nine large dark green peas in a pod; pods straight; seeds wrinkled.

246. Craig Holmes (Holmes).—Height 4½-5½ feet; haulm strong, dark green; pods dark green, single, 4-4½ inches long, with eight or nine large dark green peas in pod; pods straight; seeds wrinkled.

137. Daisy (Carter), **F.C.C.** July 11, 1902.—See p. 716.

138. Daisy, early (Carter).—Height 3 feet; haulm strong and very dark green; pods dark green, 4½-5 inches long, averaging seven very large peas in a pod; pods curved; heavy crop; seeds wrinkled.

139. Danby Stratagem (Carter), **A.M.** July 5, 1901.—For description see vol. xxxiv., p. 290.

140. Delicatesse (Carter).—Height 3½ feet; haulm very dark green and strong; pods dark green, mostly single, curved, 3 inches in length, with seven to nine good-sized peas in a pod; good crop; seeds wrinkled.

141. Dr. McLean (re-selected) (Carter).—Height 3½-4 feet; haulm and pods dark green; pods in pairs, 3½-4 inches long, averaging eight large dark green peas in a pod; pods straight; good crop; seeds wrinkled.

145. Duke of Albany (Carter). **A.M.** July 5, 1904.—For description see vol. xxix., p. 681.

144. Duke of Albany (selected) (Sutton).—A good form of this favourite variety.

142. Duke of Albany (re-selected) (Carter).—A good stock of this variety.

143. Dwarf Monarch (Carter).—Height 2½-3 feet; haulm and pods very dark green; pods mostly single, 3-3½ inches long, with five or six good-sized dark green peas; pods straight; seeds wrinkled.

205. Edible Pea (coloured flower) (Clibran's).—Height 4½ feet; haulm dark green, but rather thin; pods dark green, single, 2½-3 inches long, with six or seven good-sized peas; pods straight; seeds wrinkled.

146. Emerald Queen (Nutting).—Height 4-4½ feet; haulm strong, dark green; pods dark green, in pairs, straight, 3½-4 inches long, averaging nine large dark green peas in a pod; pods straight; seeds wrinkled.

147, 148. Eureka (Sutton, Barr).—Height 4-4½ feet; haulm and pods dark green; haulm strong; pods mostly in pairs, straight, 4-4½ inches long, with six or seven large peas in a pod; heavy crop; seeds wrinkled.

149. Evergreen Delicatesse (Carter), **A.M.** June 20, 1908.—See p. 717.

150, 151. Exhibition (Carter, Sutton, **A.M.** August 16, 1910.—For description see vol. xxxiv., p. 290.

247. Fairburn (Holmes).—Height 4-4½ feet; haulm and pods dark green; pods single, 3½-4 inches long, averaging seven large peas in a pod; pods straight; seeds wrinkled.

152. Fillbasket (Sutton), **F.C.C.** 1872.—Height 3½-4 feet; haulm strong and dark green; pods dark green, single, 3½ inches long, averaging nine good-sized peas in a pod; pods curved; seeds wrinkled.

153. Gladstone (selected) (Dobbie).—Height 3½-4 feet; haulm and pods dark green; haulm strong; pods mostly single, 4-4½ inches long, with eight to ten large dark green sweet peas; pods curved; seeds wrinkled.

248. Glenshire (Holmes).—Height 3-4 feet; haulm strong, dark green; pods dark green, single, 4 inches long, averaging six dark green peas; pods straight; seeds wrinkled.

154, 155, 156. Glory of Devon (Barr, R. Veitch, Carter), **A.M.** July 11, 1899.—Height 4 feet; haulm strong and dark green; pods dark green, mostly single, straight, 4½ inches long, with eight or nine large peas; seeds wrinkled.

157. Harvestman (Carter), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 289.

158. International (Carter), **A.M.** June 30, 1908.—For description see vol. xxxiv., p. 289.

159. Invincible (Sutton).—Height 3-3½ feet; haulm and pods dark green; pods mostly single, 4-4½ inches long, averaging nine large peas in a pod; pods straight; seeds wrinkled.

160. King of the Marrow (Carter).—Height 6-7 feet; haulm dark green, with very strong growth; pods single, straight, 3½-4 inches long, averaging eight large dark green peas; pods straight; seeds wrinkled.

206. Leicester Hero (Harrison).—Height 2½-4 feet; haulm dark green and strong; pods dark green, mostly single, 3½ inches long, with nine or ten good-sized dark green peas; pods straight; seeds wrinkled.

161. Leviathan (Carter).—Height 4-4½ feet; haulm very dark green and strong; pods dark green, mostly single, straight, 4-4½ inches long, averaging seven large dark green peas; seeds wrinkled.

249. Lochalsh (Holmes).—Height 3½ feet; haulm sturdy and dark green; pods dark green, mostly single, 4 inches long, averaging seven large dark green peas in a pod; pods straight; seeds wrinkled.

162. Magnificent (Barr), **F.C.C.** July 15, 1884.—Height 3½-4 feet; haulm and pods dark green; pods mostly single, straight, 3½-4 inches long, with six to eight large dark green peas; seeds wrinkled.

163, 164. Magnum Bonum (Barr, Sutton), **A.M.** August 16, 1910.—Height 4-4½ feet; haulm dark green and strong; pods dark green, mostly in pairs, straight, containing eight or nine large dark green peas; seeds wrinkled.

165. Maincrop (Sutton).—Height 4½-5 feet; haulm and pods dark green; very strong growth; pods mostly single, straight, 4-4½ inches long, averaging nine large dark green peas; seeds round.

166. Maincrop (Laxton).—Height 3½ feet; haulm and pods very dark green; haulm strong; pods mostly single, 3½-4 inches long, with eight or nine very large light green peas; pods straight; seeds wrinkled.

167. Majestic (Barr).—Height 3½ feet; haulm strong and dark green; pods dark green; usually single, straight, 3½ to 4 inches long, averaging nine large sweet dark green peas; pods straight; seeds wrinkled.

250. Mansfield (Holmes).—Height 5-6 feet; haulm dark green and strong; pods single, 4-4½ inches, averaging eight large peas in a pod; pods straight; seeds wrinkled.

168. Market Favourite (Carter).—Height 6 feet; haulm dark green and rather thin; pods dark green, single, straight, 3-3½ inches long, averaging eight good-sized peas in a pod; seeds round.

251. Mark Twain (Holmes).—Height 3 feet; haulm and pods dark green; pods single, 3-3½ inches long, averaging seven good-sized dark green peas; pods straight; seeds wrinkled.

169. Mars (Barr).—Height 3½ feet; haulm and pods dark green; pods mostly in pairs, straight, 4-4½ inches long, with nine or ten large green peas; seeds wrinkled.

170. Masterpiece (Sutton).—Height 3½ feet; haulm strong and dark green; pods dark green, single, straight, 4-4½ inches long, with seven to nine large dark green peas; good crop; seeds wrinkled.

171. Matchless Marrowfat (Sutton).—Height 4½-5 feet; haulm and pods dark green; haulm strong; pods mostly single, straight, 4-4½ inches long, with eight or nine large dark green peas; seeds wrinkled.

172. Model Daisy (Carter).—Height 2½ feet; haulm dark green and strong; pods dark green, usually single, straight, 3½-4 inches long with seven or eight large light green peas; seeds wrinkled.

173. Model Telegraph (Carter).—Height 5½ feet; haulm and pods dark green; strong growth; pods mostly single, straight, 3½-4 inches long, with seven to nine large dark green peas; seeds round.

174. Model Telephone (Carter).—For description see vol. xxxiv., p. 290.

175. Ne Plus Ultra (selected) (Sutton).—Height 6-7 feet; haulm dark green and strong; pods dark green, mostly single, straight, 3 inches long, with five or six large dark green peas; seeds wrinkled.

176. New Telegraph (Sutton).—Height 5½ feet; haulm dark green, but rather thin; pods dark green, mostly single, straight, 3½-4 inches long, with six to eight good-sized dark green peas; seeds round.

252. Novan (Holmes).—Height 5½-6 feet; haulm strong and dark green; pods mostly single, 4-4½ inches in length, averaging eight large dark green peas; pods straight; seeds wrinkled.

177. Omega (improved) (Carter).—Height 2-3 feet; haulm and pods very dark green; pods usually single, 3-3½ inches long, averaging seven good-sized dark green peas in a pod; pods straight; seeds wrinkled.

178. P. C. Palmer (Cannell).—Height 2½-3½ feet; haulm dark green and sturdy; pods dark green, usually single, 4½ inches long, averaging eight large peas; pods straight; seeds wrinkled.

179, 180. Peerless (Barr, Sutton), **F.C.C.** July 14, 1903.—Height 3 feet; haulm and pods dark green; strong grower; pods mostly single, straight, 4-4½ inches long, with eight to ten dark green peas; seeds wrinkled.

181. Perfection Marrowfat (Sutton).—Height 4 feet; haulm dark green and strong; pods dark green, mostly single, straight, 4-4½ inches long, averaging eight large dark green peas; seeds wrinkled.

182. Prince of Wales (Barr).—See p. 718.

183. Prince of Wales (improved) (J. Veitch).—An improved form of No. 182.

184. Prizewinner (Barr), **F.C.C.** July 5, 1901.—Germination poor. See p. 718.

185. Prodigy (J. Veitch), **F.C.C.** July 10, 1885.—Height 5-6 feet; haulm and pods dark green; pods single, straight, 4-4½ inches long, averaging eight large dark green peas; pods straight; seeds wrinkled.

186. Prolific Marrow (Sutton).—Height 3½-4 feet; haulm very dark green, sturdy; pods dark green, mostly single, straight, 3½-4 inches long, averaging seven large dark green peas; seeds wrinkled.

187, 188. Quite Content (Barr, Carter), **F.C.C.** August 14, 1906.—For description see vol. xxxiv., p. 290.

189. Royal Jubilee (Sutton).—Height 4½-5 feet; haulm and pods dark green; haulm strong; pods mostly single, straight, 4½-5 inches long, averaging nine large dark green peas; seeds wrinkled.

190. Royal Standard (Smith).—Height 6-7 feet; haulm very dark

green, with very strong growth; pods dark green, single, straight, 5 inches long, averaging ten large dark green peas; seeds wrinkled.

191. Satisfaction (Sutton), **A.M.** August 16, 1910.—Height 4 feet; haulm very dark green and strong; pods dark green, usually single, 4-4½ inches long, averaging seven large dark green peas; pods straight; seeds wrinkled.

207. Saxonia (Harrison).—Height 3½ feet; haulm dark green, but rather thin; pods dark green, single, 3 inches long, with four or five small peas in each; pods straight; seeds round.

204. Seedling 229 (Carter).—Height 5 feet; haulm dark green and strong; pods dark green, single, 3½ inches long, with six to eight large dark green peas in each; pods straight; seeds wrinkled.

256. Seedling No. 19 (Holmes).—Height 3½-4½ feet; haulm strong and dark green; pods single, 4-4½ inches long, averaging eight large dark green peas in a pod; pods straight; seeds wrinkled.

257. Seedling No. 80 (Holmes).—Height 3-5 feet; haulm and pods dark green; pods usually single, 3½-4 inches long, averaging six large dark green peas in a pod; pods curved; seeds round.

258. Seedling No. 6 (Holmes).—Height 2 feet; haulm dark green and strong; pods dark green, single, 4½-5 inches long, averaging ten good-sized dark green peas; pods straight; seeds wrinkled.

192. Sharpe's Standard (Barr).—Height 5½ feet; haulm and pods dark green; haulm strong; pods single, 4-4½ inches long, with eight or nine large dark green peas; pods straight; seeds wrinkled.

193. Sharpe's Queen (Barr), **A.M.** July 5, 1901.—Height 2½ feet; haulm and pods dark green; pods single, 3½-4 inches long, averaging seven large dark green peas; pods straight; seeds wrinkled.

255. Skibo (Holmes).—Height 5 feet; haulm dark green and strong; pods single, 4-5 inches long, averaging seven large dark green peas; pods straight; seeds wrinkled.

194, 195. Stratagem (Barr, Carter).—See p. 718.

196. Stratagem, re-selected (Carter).—For description see vol. xxxiv., p. 290.

253. Strathpeffer = Nonsuch × Gladstone (Holmes).—Height 3-3½ feet; haulm dark green and strong; pods mostly single, 4-4½ inches long, with seven or eight large peas; seeds round.

254. Strathpeffer = Ideal × Seedling 32 (Holmes).—Height 2½ feet; haulm and pods dark green; pods usually single, 2½-3 inches long, with four to six small peas in a pod; pods straight; seeds round.

198. The Bell (Carter), **A.M.** August 15, 1905.—Height 4½ feet; haulm dark green and strong; pods dark green, single, 4½-5 inches long, averaging nine very large dark green peas; pods straight; seeds wrinkled.

259. The Count (Holmes).—Height 3-4 feet; haulm and pods dark green; haulm strong; pods single, 4½-5 inches long, averaging nine large peas in a pod; pods straight; seeds wrinkled.

260. The Cromarty (Holmes).—Height 2½-4 feet; haulm strong and dark green; pods single, 3½-4 inches long, averaging seven large dark green peas in a pod; pods straight; seeds round.

261. The Duke (Holmes).—Height 5 feet; haulm and pods dark green; haulm strong; pods single, 3-4 inches long, averaging eight large light green peas in a pod; pods straight; seeds wrinkled.

262. The Dornoch (Holmes).—Height 3 feet; haulm very dark green and strong; pods dark green, mostly single, 3½-4 inches long, averaging eight large dark green peas; pods curved; seed wrinkled; germination poor.

263. The Ross-shire (Holmes).—Height 3 feet; haulm and pods dark green; haulm strong; pods single, 3½-4 inches long, with eight or nine large dark green peas; pods curved; seeds wrinkled.

264. The Tarbat (Holmes).—Height 3½ feet; haulm and pods mostly single, 3½ inches long, with seven or eight large dark green peas in a pod; pods straight; seeds wrinkled.

199, 200. Veitch's Perfection (Sutton, R. Veitch).—Height 4-4½ feet; haulm and pods dark green; pods usually in pairs, 3-3½ inches long, averaging six light green peas in a pod; pods straight; seeds wrinkled.

201. Windsor Castle (Sutton), **A.M.** August 16, 1910.—Height 4-4½ feet; haulm dark green, strong; pods usually in pairs, dark green, 4-5 inches long, with eight or nine large light green peas; pods straight; good crop; seeds wrinkled.

202. Yorkshire Hero (Sutton), **A.M.** August 16, 1910.—Height 4½ feet; haulm very dark green and strong; pods dark green, usually single, 3-3½ inches long, with five or six large sweet light green peas; pods straight; good crop; seeds wrinkled.

203. Zenith (Cannell).—Height 3½-4½ feet; haulm and pods dark green; pods mostly single, 4 inches long, with seven or eight large dark green peas; pods straight; seeds wrinkled.

Late Varieties.

211. Absolute (Smith).—Height 4 feet; haulm dark green, but rather thin; pods usually in pairs, 4 inches long, dark green, averaging seven large dark peas in a pod; seeds wrinkled.

208. Anticipation (Carter).—Height 4 feet; haulm rather weak; pods light green, usually in pairs, 4 inches long, with five to seven large dark green peas in a pod; seeds wrinkled.

209, 210. Autocrat (J. Veitch, Barr), **F.C.C.** July 10, 1885.—Height 5 feet; haulm strong, dark green; pods in pairs, 3-4 inches long, dark green, averaging eight large dark green peas; seeds wrinkled.

212, 213. Captain Cuttle (Carter, Barr), **A.M.** July 14, 1897.—Height 5 feet, dark green; pods generally in pairs, 4 inches long, dark green, with seven or eight large dark green peas; seeds wrinkled.

214. Continuity (Sutton), **A.M.** July 9, 1898.—Height 6 feet; haulm dark green, but rather weak; pods 3½-4 inches long, dark green, usually in pairs, averaging eight large dark green peas; seeds wrinkled.

215. Dreadnought (Carter).—Height 3-4 feet; haulm dark green,

but rather thin; pods 3-4 inches, dark green, generally in pairs, averaging six large dark green peas; seeds wrinkled.

216. French Sugar (Sutton).—Height 6 feet; haulm light green, but rather thin; pods 3-4 inches long, usually in pairs, with six or seven large light green peas in a pod; seeds round.

217. Gladstone (Carter).—Height 4 feet; haulm dark green and fairly strong; pods 3½-4½ inches long, dark green, generally in pairs, with nine or ten large dark green peas in a pod; seeds wrinkled.

218. Gladstone, selected (Sutton).—Height 3-3½ feet; haulm dark green, but rather thin; pods 3½ inches long, dark green, usually single, with nine or ten large dark green peas in a pod; seeds wrinkled.

219. Goldfinder (R. Veitch).—Height 4 feet; haulm light green, and weak; pods 2½-3 inches long, dark green, usually in pairs, averaging five large dark green peas in a pod; seeds wrinkled.

220. Giant (Carter).—Height 3½ feet; haulm dark green, fairly strong; pods 3½-4½ inches long, dark green, usually in pairs, with eight or nine large dark green peas in a pod; seeds wrinkled.

230. Late Duke (Carter), **A.M.** September 9, 1910.—Height 7 feet; haulm rather thin; pods 4½-5½ inches long, dark green, usually single, with six or seven very large dark green peas in a pod; seeds wrinkled.

221. Late Queen (Barr), **A.M.** July 10, 1900.—Height 3½ feet; haulm dark green, strong; pods usually single, 3½ inches long, dark green, averaging six good-sized green peas; seeds wrinkled.

222. Late Queen (Sutton).—Failed entirely.

223. Michaelmas (Carter).—Height 4½ feet; haulm dark green, strong; pods 3 inches long, dark green, in pairs, averaging seven large dark green peas in a pod; seeds wrinkled.

224, 225. Ne Plus Ultra (Carter, Barr).—Height 6½ feet; haulm light green, rather weak growth; pods 3 inches long, light green, usually single, averaging six large dark green peas in a pod; seeds wrinkled.

226. Omega (Carter), **F.C.C.** 1872.—Height 4 feet; haulm dark green, strong growth; pods 3-3½ inches long, dark green, in pairs, averaging seven large dark green peas in a pod; seeds wrinkled.

227. Queen (Carter).—Height 4 feet; haulm light green, pods 3-4 inches long, dark green, usually in pairs, with seven to nine large dark green peas in a pod; seeds wrinkled.

228. Rearguard (Carter).—Height 5 feet; haulm dark green, strong; pods 3½-4½ inches long, dark green, generally in pairs, with nine or ten large dark green peas in a pod; seeds wrinkled.

231. Seedling 231 (Carter).—Height 7 feet; haulm dark green, moderate growth; pods usually single, 3-4 inches long, averaging four large dark green peas in a pod; seeds wrinkled.

229. Veitch's Perfection (Barr).—See p. 724.

POTATOS AT WISLEY, 1910.

EIGHTY-NINE stocks of Potatos were received for trial, and all were planted on April 11, in rows 3 feet apart, and 18 inches apart in the rows, on ground that had been previously deeply dug and moderately manured. All the stocks made excellent growth, but, probably owing to the dull and cold season, there was some disease. Generally the crops were very good, and the Committee examined them on three occasions. On account of their heavy crop, fine appearance, and freedom from disease, the Committee ordered the following varieties to be cooked:—

Ashleaf.
Ashleaved Kidney.
Chambers' Prima Donna.
Dew's Favourite.
Epicure.
Faithlie.
Irish King.
Lady Llewelyn.
May Queen.
Ninetyfold.
Pride of Devon.
Selected Ashleaf.
Staffordian.
Walker's Seedling

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

VARIETIES.

1. Sharpe's Express.
2. Sharpe's Victor.
3. Myatt's Ashleaf.
4. Selected Ashleaf.
5. Ashleaf.
6. Myatt's Ashleaf.
7. Ashleaved Kidney.
8. Lemon Kidney.
9. Pride of Devon.
10. Lady Llewelyn.
11. Woodstock Kidney.
12. Fenn's Earliest Frame.
13. Fenn's Seedling.
14. Chambers' Prima Donna.
15. Early Reliance.
16. May Queen.
17. Walker's Seedling.
18. The Herald.
19. Faithlie.
20. Pocock's Seedling.
21. Seedling No. 1.
22. Lady Llewelyn.
23. Fenn's Early Marketing.
24. Rival.
25. Peter Barr.
26. Early Rose.
27. Jack's No. 1.
28. Sealand Bee.
29. Sir John Llewelyn.
30. Ninety-fold.
31. Epicure.
32. Early Puritan.
33. Cigarette.
34. Windsor Castle.
35. The Diamond.
36. Early Reliance.
37. Royal County.
38. Robert Fenn.
39. Fenn's Early Border.
40. Beauty of Braywick.
41. Scottish Chief.
42. Neston Bee.
43. Staffordian.
44. Alexandra.

45. Nulli Secundus.
46. Dew's Favourite (improved).
47. Duchess of Buccleuch.
48. Ash-top Fluke.
49. Cannell's Vanolia.
50. Norfolk Champion.
51. Pink Hero.
52. Sharpe's Express.
53. Lady Llewelyn.
54. Waungron.
55. The Locka.
56. The Loyne.
57. Dr. Johnson.
58. Jan Ridd.
59. Snowdrop.
60. Up-to-Date.
61. General French.
62. Imperial Beauty.
63. British Queen.
64. The Factor.
65. Ringleader.
66. Harbinger.
67. Beauty of Hebron.
68. Leicester Wonder.
69. President.
70. The Colleen.
71. Bedowin.
72. The Chapman.
73. The Admiral.
74. Duchess of Cornwall.
75. Snowdrift.
76. New Beauty.
77. Southern Queen.
78. Chiswick Favourite.
79. The Colleen.
80. Cannell's Favourite.
81. Vicar of Laleham.
81A. Unnamed.
82. Unnamed.
83. Black Seed.
84. Irish King.
85. Dalmeny Early.
86. Garnet.
87. Golden Nugget.
88. Large Seed.

44. Alexandra (Bates).—White, round kidney; eyes shallow; tubers medium; crop good; haulm weak; mid-season.

7. Ashleaved Kidney (A) (Sands).—A variety of Ashleaf kidney; early.

5. Ashleaf (B. W. Green).—White kidney; size large; eyes shallow; crop good; haulm weak; early.

48. Ash-top Fluke (Leigh).—White, round kidney; eyes deep; size large; crop excellent; haulm sturdy; early.

40. Beauty of Braywick (Tidy).—White, flat kidney; eyes shallow; tubers medium; crop good; badly diseased; haulm strong; early.

67. Beauty of Hebron (Barr), **A.M.** August 14, 1900.—White, round kidney; eyes deep; size large; crop good; haulm strong; early.

71. Bedowin (Moore).—White, round kidney; eyes deep; tubers large to medium; crop good; haulm very strong; mid-season.

63. British Queen (Barr), **A.M.** August 15, 1905.—For description see vol. xxxv., p. 493.

83. Black Seed (Kemp).—Red, flat kidney; eyes shallow; tubers large; fair crop; haulm strong; late.

80. Cannell's Favourite (Cannell).—White, round kidney; eyes shallow; tubers medium; crop good; haulm strong; mid-season.

14. Chambers' Prima Donna (Chambers), **A.M.** September 13, 1910.—Flat, white kidney; eyes very shallow; tubers medium; crop excellent; haulm very strong; early.

78. Chiswick Favourite (J. Veitch), **F.C.C.** March 30, 1886.—For description see vol. xxxv., p. 491.

33. Cigarette (Barr), **A.M.** November 21, 1905.—White, round kidney; eyes shallow; size large; crop good; badly diseased; haulm strong; early.

85. Dalmeny Early (Barr), **A.M.** September 13, 1910.—White, round kidney; eyes shallow; size medium; crop good; haulm strong; early.

46. Dew's Favourite (improved) (Dew), **A.M.** August 2, 1910.—White, round kidney; eyes shallow; tubers large; crop heavy; early.

57. Dr. Johnson (R. Veitch).—White, flat kidney; shallow eyes; size medium; crop poor; haulm strong; mid-season.

47. Duchess of Buccleuch (Taylor).—White, irregular, round kidney; eyes shallow; tubers small; crop good; haulm strong.

74. Duchess of Cornwall (J. Veitch), **A.M.** October 24, 1905.—For description see vol. xxxv., p. 495.

32. Early Puritan (Barr), **A.M.** August 16, 1900.—White, round kidney; eyes very deep; tubers large; crop good; slightly diseased; haulm fairly strong; early.

36. Early Reliance (Taylor).—White, round kidney; eyes shallow, tinged with pink; tubers medium; crop good; haulm fairly strong; early.

15. Early Reliance (G. Taylor).—White, round kidney; eyes pink, shallow; tubers good size; crop good, and free from disease; haulm strong; early.

26. Early Rose (Barr).—Red, round kidney; eyes shallow; size large; crop good; haulm very strong; early.

31. Epicure (Barr), **A.M.** August 15, 1905.—For description see vol. xxxv., p. 492.

19. Faithlie (Smith, Aberdeen), **A.M.** August 2, 1910.—White, round kidney; eyes shallow; tubers large; crop good; somewhat diseased; haulm strong; early.

39. Fenn's Early Border (Fenn).—White, round kidney; eyes shallow; size medium; crop good; haulm strong; early.

12. Fenn's Earliest Frame (Fenn).—Too poor to describe.

23. Fenn's Early Marketing (Fenn).—White, round kidney; eyes deep; size small; crop poor; slightly diseased; haulm weak; early.

13. Fenn's Seedling (Fenn).—White, flat kidney; size medium; haulm weak; mid-season.

86. Garnet (Powell).—Red, flat kidney; eyes shallow; tubers medium; crop good; haulm strong; mid-season.

61. General French (Barr), **A.M.** October 1, 1901.—White, round kidney; eyes shallow; tubers large; crop good; haulm strong; mid-season.

87. Golden Nugget (Steward).—White, round kidney; eyes deep; tubers medium; crop good; mid-season.

66. Harbinger (Barr), **A.M.** August 5, 1897.—For description see vol. xxxv., p. 492.

62. Imperial Beauty (Barr).—White, round kidney; eyes shallow; tubers large; crop good; haulm strong; mid-season or late.

84. Irish King (Barr).—White, round kidney; eyes shallow; tubers medium; excellent crop; haulm strong; mid-season.

27. Jack's No. 1 (Wilson).—White, flat kidney; tubers large; eyes shallow; crop good; free from disease; haulm strong; early.

58. Jan Ridd (R. Veitch).—White, round kidney; eyes deep; tubers medium; crop good; haulm very strong; mid-season.

10, 22, 53. Lady Llewelyn (J. Veitch, R. Veitch, Harris).—For description see vol. xxxv., p. 492.

88. Large Seed (Blackmore).—Too poor to describe; late.

68. Leinster Wonder (Williamson).—White, round kidney; eyes deep; size medium; crop good; haulm strong; mid-season.

8. Lemon Kidney (Booth).—White kidney; size medium; eyes shallow; crop good; slightly diseased; haulm strong; early.

16. May Queen (Barr), **A.M.** August 15, 1905.—White, flat kidney; eyes shallow; tubers large; crop heavy; free from disease; haulm very strong; early.

3. Myatt's Ashleaf (Dobbie).—White kidney of the Ashleaf type; size large; eyes shallow; crop good, and free from disease; haulm weak; early.

6. Myatt's Ashleaf (O) (Sands).—Crop poor, badly diseased; early.

42. Neston Bee (Bees).—White, flat kidney; eyes shallow; tubers very small; crop large; haulm strong.

76. New Beauty (J. Veitch).—White, round kidney; eyes shallow; tubers small; crop good; haulm strong.

30. Ninetyfold (Barr), **A.M.** July 10, 1900.—White, flat kidney; eyes deep; tubers large; crop excellent, free from disease; haulm strong; early.

50. Norfolk Champion (Miller).—White, flat kidney; eyes shallow; size medium; crop poor; haulm strong.

45. Nulli Secundus (Bates).—White, round kidney; eyes shallow; tubers medium; crop good; haulm strong; early.

25. Peter Barr (Fenn).—White, round kidney; eyes shallow; tubers medium; crop poor; somewhat diseased; haulm weak; early.

51. Pink Hero (Davies).—Red, round kidney; eyes shallow; tubers medium; crop poor; haulm strong.

20. Pocock's Seedling (Pocock).—White, round kidney; eyes deep; tubers medium; crop good, free from disease; haulm strong.

69. President (Williamson), **F.C.C.** November 3, 1881.—White, round kidney; eyes deep; tubers medium; crop poor; haulm very strong.

9. Pride of Devon (R. Veitch).—For description see vol xxxv., p. 492.

65. Ringleader (Barr), **A.M.** July 10, 1900.—White, round kidney; eyes shallow; tubers small; fair crop; haulm strong.

24. Rival (Barr).—White, flat kidney; eyes shallow; tubers large; crop good; haulm strong; early.

38. Robert Fenn (Fenn).—White, round kidney; eyes shallow; tubers medium; crop good; haulm strong; mid-season.

37. Royal County (Fenn).—White, round kidney; eyes shallow; tubers large; crop good; haulm strong; mid-season.

41. Scottish Chief (Barr).—For description see vol. xxxv., p. 495.

28. Sealand Bee (Bees).—White, round kidney; eyes shallow; size large; crop good, free from disease; haulm very strong.

21. Seedling No. 1 (Harris).—White, flat kidney; eyes shallow; size medium; crop poor; free from disease; haulm very strong; early.

4. Selected Ashleaf (Barr), **A.M.** August 2, 1910.—White kidney, Ashleaf type; tubers large; eyes shallow; heavy crop, free from disease; haulm rather weak; early.

1, 52. Sharpe's Express (Barr, J. Veitch).—For description see vol. xxxv., p. 493.

2. Sharpe's Victor (Barr), **A.M.** April 25, 1893.—For description see vol. xxxv., p. 493.

29. Sir John Llewelyn (Barr), **A.M.** September 11, 1900.—White, round kidney; eyes deep; tubers medium; crop good, slightly diseased; haulm strong; early.

75. Snowdrift (J. Veitch).—White, round kidney; eyes shallow; tubers small; crop good; haulm strong; mid-season.

59. Snowdrop (Barr), **F.C.C.** August 30, 1883.—White, flat kidney; eyes deep; tubers medium; good crop; haulm strong; mid-season.

77. Southern Queen (J. Veitch), **A.M.** November 21, 1905.—White, flat kidney; eyes very shallow; tubers medium; crop good; haulm strong; mid-season.

43. Staffordian (Davies).—White, flat kidney; eyes deep; size medium; crop very good; haulm very strong; mid-season.

73. The Admiral (Dobbie).—For description see vol. xxxv., p. 495.

72. The Chapman (Dobbie).—For description see vol. xxxv., p. 495.

70, 79. The Colleen (Williamson, J. Veitch), **A.M.** August 9, 1907. —For description see vol. xxxv., p. 493.

35. The Diamond (Barr).—White, round kidney; eyes deep; tubers large; crop good; haulm strong; mid-season.

64. The Factor (Barr), **F.C.C.** April 25, 1905.—White, flat kidney; eyes deep; tubers large; crop good; haulm strong; late.

18. The Herald (Robinson).—White, flat kidney; eyes shallow; tubers large; crop fair; haulm strong; early var.

55. The Locka (Robinson).—White, round kidney; eyes shallow; size medium; crop good; haulm strong; mid-season.

56. The Loyne (Robinson).—White, round kidney; eyes shallow; tubers medium; crop good; haulm strong; late.

81A. Unnamed, descended from Lord Tennyson (Salwey).—Too poor to describe.

82. Unnamed (?).—White, round kidney; eyes deep; tubers medium; crop poor; haulm fairly strong; late.

60. Up-to-Date (Barr).—White, round kidney; eyes very shallow; tubers large; crop very good; haulm strong; late.

81. Vicar of Laleham (Salwey).—Red, round kidney; eyes shallow; tubers medium; crop fair; haulm strong; mid-season.

49. Vanolia (Cannell).—For description see vol. xxxv., p. 493.

17. Walker's Seedling (Brewer), **A.M.** August 2, 1910.—White, round kidney; eyes shallow; large tubers; crop excellent; free from disease; haulm strong; early.

54. Waungron (Powell).—White, round kidney; eyes deep; tubers medium; crop good; haulm strong; mid-season.

34. Windsor Castle (Barr), **F.C.C.** September 12, 1893.—White, round kidney; eyes shallow; tubers large; crop good; slightly diseased; haulm strong; early.

11. Woodstock Kidney (Fenn), **F.C.C.** October 15, 1878.—White, round kidney; size small; eyes very shallow; crop good, free from disease; haulm weak; early.

SALADS AT WISLEY, 1910.

A VERY extensive trial of Salads was made in the Gardens, which excited a good deal of interest during the year. We would particularly draw attention to American Cress, Nos. 13, 14, and 15. The same plants produced an abundant supply of delicious leaves from June to January; the flavour is very warm, but mixed with other salading it is a welcome ingredient. Lettuce No. 72 (*Salade Romaine*) is the exquisite variety so much grown and appreciated in Paris, and No. 81 is another Lettuce of the same type. *Chenopodium amaranticolor* is a most beautiful foliage plant, and is equally suitable as a vegetable or salad. When cooked it is similar to Spinach in appearance, but distinct in flavour, tasting more like young nettles, and as it is a rampant grower it produces a great quantity of foliage. When used as a salad most of the reddish-purple pigment on the leaves washes out, causing the water used for washing it and the salad dressing to become quite red. The Dandelions, Chicory, and Endive were all lifted and grown on in darkness in a gentle heat in winter; and the despised Dandelion is really excellent grown in this way, losing all its bitterness and making a very pleasant addition to a salad. A plan that answered admirably with Endive in the open was to cover a large quarter with common bracken fronds to the depth of 6 or 8 inches; this excluded the light and blanched the foliage beautifully. The Fruit and Vegetable Committee inspected the collection growing on several occasions, and the blanched salading was placed before them on three occasions during the winter months.

F.C.C.=First-class Certificate.

A.M.=Award of Merit.

XXX=Highly Commended.

CELERY.

19. Moore's White (Harrison). — Tall, strong, compact; outer leaves green; hearts white, solid, crisp; growth regular; good flavour.

20. Golden Self-blanching (Sutton). — Dwarf, strong, compact; outer leaves faintly tinged with pink; heart white, crisp, with a good flavour.

21. White Plume (Sutton).—For description see vol. xxxiii., p. 531.

22. Celeriac (Sutton).—Bulbs large, nearly smooth, with a good spread of foliage.

CHICORY.

33. Chicory "Winter Giant" (Toogood).—Foliage light green, 6-9 inches high and 1-1½ inch in width; very much toothed.

34. "Christmas Salad" (Sutton).—Foliage light green; 6-9 inches high and 1-2 inches in width; good grower.

CORN SALAD (*Valeriana oblitoria*).

1. Broad Italian (Toogood).—Leaves 4 inches long and about 1½ inch broad; dark green; plants 4 inches high; vigorous grower.

2. Broad-leaved (Carter).—Leaves about 4 inches long and about ¾ inch wide; dark green; strong grower.

3. Cabbaging (Nutting).—3 inches in height; leaves 3 inches long and ¾ inch broad; very dark green; strong.

4. Concave-leaved (Barr).—Leaves about 3 inches long and 1 inch broad; dark green; strong grower.

5, 6. English (Nutting, Sutton).—Similar to No. 4.

7, 8. Green Cabbaging (Sutton, Barr).—Similar to No. 3.

9. Green Etampes (Barr).—3 inches high; leaves 3 inches long by 1 inch broad; very dark green; strong grower.

10. Green Louviers (Nutting).—Plants 4 inches high; leaves 3-4 inches long by 1 inch broad; very dark green; strong.

11. Green Rouen (Barr).—Plants 4-4½ inches high; leaves 3-4 inches long by 1 inch broad; very dark green; strong.

12, 13, 14. Italian (Nutting, Carter, Sutton).—Plants 4 inches high; green; leaves about 4 inches long by 1 inch broad; vigorous grower.

15. Italian Lettuce-leaved (Barr).—3 inches in height; leaves 3-3½ inches long by ¾ inch broad; light green; germination bad.

16. Parisian Lettuce-leaved (Carter).—Plants 4 inches high; leaves long and broad; dark green; very vigorous grower.

17. Round-leaved Dutch (Barr).—Plants about 4 inches high; leaves 3 inches long by 1 inch broad; very dark green; vigorous grower.

18. Winter Gathering (Sutton).—Plants 9-12 inches high; leaves light green, 9-10 inches long by 3-4 inches wide; margins of leaves curled. These plants had very much the appearance of lettuces.

ENDIVE.

1. All the Year Round (Barr).—Foliage large and finely curled; dark green; spreading; vigorous; good blancher.

2. Batavian Green Lettuce-leaved (Barr).—Foliage broad and long; growth vigorous; good blancher.

3. Batavian Imperial Green (Barr).—Foliage broad, long; light green; upright; vigorous grower; one of the first to blanch.

4. Broad-leaved Batavian (R. Veitch), **XXX** November 22, 1910.—Foliage large, dark green; vigorous grower; spreading; an early blancher.

5. French Moss-Curled (R. Veitch).—Foliage long, upright; dark green; very vigorous grower.

6. Exquisite (Sutton).—Foliage short, light green, spreading; slow to blanch.

7. Extra Fine Green Curled (Barr).—Foliage short, spreading, dark green; vigorous grower; a good quick blancher.

8. Extra Green Curled (Sutton).—Foliage short, spreading, dark green; strong grower; rather slow in blanching.

9. Giant Staghorn (Barr).—Foliage large, upright.

10, 11, 12. Green Curled (R. Veitch, J. Veitch, Sutton), **XXX** November 22, 1910.—Foliage long, dark green; very vigorous grower; 9-12 inches high; one of the earliest to blanch.

13. Green Parisian (Barr).—Foliage short, spreading, dark green; strong grower; a quick blancher.

14. Imperial White Batavian (Sutton).—Foliage long and broad, upright, light green; strong grower; a quick blancher.

15. Incomparable (Sutton).—Foliage long, upright, dark green, and strong; quick blancher.

16. Large Lettuce-leaved (Toogood).—Foliage short, spreading, light green; rather slow in blanching.

17. Lettuce-leaved (Jas. Veitch).—Foliage short, upright, light green; vigorous; a good blancher.

18. Louviers (Barr).—Foliage long, spreading, dark green, strong; quick blancher.

19. Model (Carter).—Foliage short, spreading, dark green, vigorous; good blancher.

20, 21, 22. Moss-Curled (Carter, J. Veitch, Toogood).—Foliage long, upright, strong, dark green; good blancher.

23. Panaclier (Barr).—Foliage long, upright, dark green, strong; one of the first to blanch.

24. Perfect Curled (Toogood).—Foliage short, spreading, dark green, strong grower; an early blancher.

25. Perfection Silver Moss-Curled (Barr).—Foliage short, spreading, light green, vigorous; rather slow in blanching.

26, 28. Round-leaved Batavian (Sutton, J. Veitch), **F.C.C.** October 11, 1878.—Foliage long and broad, light green, upright, strong; quick blancher.

27. Round-leaved Batavian, improved (R. Veitch), **XXX** November 22, 1910.—For description see vol. xxvi., p. 866.

29. Ruffec Giant Curled (Barr).—Foliage long, upright, dark green, very vigorous; good blancher.

30. Staghorn (Barr).—Foliage short, spreading, dark green; vigorous; one of the first to blanch.

31, 33, 34. White Curled (Sutton, R. Veitch, J. Veitch). **F.C.C.** October 11, 1878.—Foliage short, spreading, light green; vigorous; quick in blanching.

32. White Batavian (R. Veitch).—For description see vol. xxvi., p. 866.

35. White Lettuce-leaved (Barr).—Foliage long and broad, spreading, light green; strong; slow in blanching.

36. Winter Curled (Sutton).—Foliage long, upright, light green; strong; quick blancher.

37. Winter Giant (Toogood), **XXX** November 22, 1910.—Foliage long, upright, dark green; vigorous; very quick blancher.

38. Winter Lettuce-leaved (Sutton).—Foliage long and broad, upright, dark green; strong; good blancher.

39. Winter Queen (Barr).—Foliage long and narrow, upright, light green; strong; slow in blanching.

LETTUCE.

Cabbage Varieties.

1. A 1 (Cannell).—A small, slow-growing variety of the Tennis Ball type.

2. A 1 (Sutton).—A large, green, coarsely crinkled variety of the Drumhead type; dark green leaves; heart solid and firm.

3. All Heart (Toogood).—A large, coarsely crinkled variety of the Drumhead type, having the leaves tinged with bronze.

4. Algiers (Barr).—A medium-sized lettuce of the All the Year Round type; makes a solid heart, but is inclined to run to seed early.

5. Brittle Ice (Cannell).—A good lettuce of the Drumhead type, with large crinkled leaves and a very pleasant flavour.

6. Brown Percheronne (Barr).—A strong-growing variety of the Drumhead type; leaves tinged with brown; does not make a solid heart.

7. Californian Curled (Barr).—A vigorous grower, having the edges of the leaves much crinkled; open spreading habit.

8. Central Market Forcing (Barr).—Considered useless by the Committee.

9. Commodore Nutt (Sutton), **A.M.** July 5, 1910.—A dwarf, compact variety; very early.

10. Continuity (R. Veitch), **A.M.** June 20, 1901.—A strong-growing variety, with deep bronze-coloured leaves; makes a large lettuce with a good, firm heart.

11. Duke of Cornwall (R. Veitch), **A.M.** July 5, 1901.—An excellent variety of the Drumhead type, with rough, crinkled leaves; makes a large solid head; stock true.

12. Drumhead Selected (Barr).—A strong grower, with coarsely crinkled leaves; open spreading habit, but makes a large solid lettuce.

13. Early Open Air (Barr).—A large lettuce of the Drumhead type, having large leaves; makes a fairly solid heart.

14. Early Paris Gem (Barr).—A good variety of the Tom Thumb type, with crinkled leaves; makes a firm heart.

15. Early White Spring (Barr).—Considered useless by the Committee.

16. Favourite (Sutton).—A variety with large crinkled leaves and spreading habit; makes little heart.

17. Forcing Milly (Barr).—A good variety of the All the Year Round type; edges of leaves slightly tinged with brown; heart good and solid.

18. Golden Ball (Sutton).—A variety of the Tom Thumb type which turns in quickly and quickly runs to seed.

19. Golden Winter (Toogood).—A spreading variety of the Drumhead type; leaves large, crinkled; makes very poor heart.

20. Green Favourite (Barr), **A.M.** August 21, 1910.—A good lettuce of the All the Year Round type, with dark green leaves; makes a firm heart.

21. Green Fringed (Barr).—A medium-sized variety, having fringed leaves and a spreading habit; does not heart well.

22. Harbinger Forcing (Barr).—A poor stock of the Malta type, with pale greenish-yellow, coarsely crinkled leaves; makes very little heart.

23. Heartwell (Sutton), **A.M.** August 2, 1910.—An excellent variety of the All the Year Round type, with dark green leaves; makes a good solid heart; stock true.

24. Holborn Standard (Carter).—A very useful lettuce of the Drumhead type, with pale green, slightly bronzed leaves; hearts quickly; stock true.

25. Icehead (Barr), **A.M.** August 2, 1910.—A good lettuce of the All the Year Round type.

26. Iceleaf (R. Veitch), **A.M.** August 13, 1895.—An excellent lettuce of the Drumhead type, with roughly crinkled leaves tinged with bronze; makes a fine solid heart.

27. Ideal (Toogood).—Considered undesirable by the Committee.

28. Ideal (Sutton).—An excellent variety of the All the Year Round type; leaves pale green tinged with bronze; makes a firm, solid heart and turns in quickly.

29. Large Beaulieu (Barr).—A pale green lettuce of the Drumhead type; makes a poor heart.

30. Little Gem (Barr), **A.M.** June 20, 1901.—An excellent variety of the Tom Thumb type, with yellowish-green leaves; hearts quickly; stock even and true.

31. Longstander (Carter).—A pale green lettuce of the Drumhead type, which runs to seed early.

32. Magnificent (Harrison).—Considered undesirable by Committee in 1909 trial.

33. Mammoth White (Sutton).—An enormous lettuce of the Cos type; does not heart well.

34. Marvel of the Season (Toogood).—A variety of the Continuity type; leaves crinkled, reddish-brown, spreading habit; small heart.

35. Market Favourite (Barr).—A good lettuce of the Drumhead type; leaves crinkled; makes a good, firm heart.

36. Matchless (Sutton).—A variety of the All the Year Round type; leaves pale green; makes a small, firm heart.

37. Neapolitan (Barr).—A lettuce of the All the Year Round type, having crinkled leaves; does not make a firm heart.

38. Nonsuch (Sutton).—Considered undesirable by the Committee in 1909 trial.

39. Paragon (Barr).—A fine lettuce of the All the Year Round type; pale green leaves and good, firm heart.

40. Perfection (Sutton).—A useful lettuce with a good heart.

41. Red Fringed (Toogood).—Considered undesirable by Committee.

42. Royal Albert (R. Veitch).—A variety of the All the Year Round type; leaves pale green; margins roughly crinkled; makes a good, firm heart.

44. Standwell (Sutton).—A useful lettuce of the All the Year Round type; makes a solid heart and stands well.

45. Supreme (Sutton), **A.M.** August 2, 1910.—A coarsely crinkled variety of the Drumhead type; leaves tinged with bronze; makes a solid heart.

46. Tom Thumb Selected (Barr).—An excellent lettuce; makes a small, firm head; useful for frame cultivation.

47. Tom Thumb Improved (Sutton).—See No. 46.

48. Trocadero (Barr).—A useful variety of the Drumhead type, with large pale green leaves tinged with bronze; makes a good, firm heart.

49. White Marvel of Cazard (Barr).—A useful lettuce of the Drumhead type; leaves large and spreading; does not make a good heart.

50. Wonderful (Sydenham).—A large lettuce of the Drumhead type, with crinkled leaves of a dark green colour; makes a poor heart.

51. White Silesian (Barr).—A variety of the Drumhead type, with large crinkled leaves slightly tinged with brown; does not heart well.

52. White Favourite (Barr). **A.M.** August 2, 1910.—A variety of the All the Year Round type, making a good heart.

53. White Tennis Ball (Barr).—Considered undesirable by the Committee.

54. The New Yorker (Barr).—A large lettuce of the Drumhead type, with large, crinkled leaves; makes a good, solid heart.

72. Salade Romaine (Sutton).—A most excellent lettuce of the All the Year Round type; leaves tightly folding; good heart. This variety is extensively grown on the Continent.

81. Laitue Grosse Blonde Paresseuse (Sir Albert Rollit).—A large lettuce of the All the Year Round type.

Cos Varieties.

43. Salade Parisienne (Sutton).—A Cos variety with medium-sized leaves; stands well, but does not make a very good heart.

55. Balloon (Barr).—A strong-growing variety of the Cos type, with large leaves and a good heart.

56. Chesnay Large White (Barr).—A strong-growing Cos variety, with a good heart.

57. Covent Garden Summer White (Barr), **XXX** August 3, 1909.—A fine large lettuce of the Cos type, with a tightly folding, self-hearting habit; makes a large, solid head; stands well.

58. Eclipse (Barr).—A small Cos variety, with dark green, self-folding leaves; stands well.

59. Emerald Queen (Barr), **XXX** August 3, 1909.—A fine variety of the Cos type; makes immense heads, self-folding; hearts white and firm, and stands well.

60. Express (Toogood).—A small Cos variety, with fairly firm heart.

61. Golden Yellow (R. Veitch).—A variety with yellowish-green leaves; open habit, and makes little heart.

62. Green Paris (Barr).—A good Cos variety, with dark green, self-folding leaves; makes a good heart, and stands well.

63. Immense Green (Harrison), **XXX** August 3, 1909.—An excellent lettuce of the Cos type; heads large and firm, with a tight, self-folding habit; stands well.

64, 65. Jumbo (Barr, Carter), **A.M.** July 5, 1901.—A useful lettuce of the Cos type; makes a nice, firm head, with solid, firm heart; stands well.

66. Little Wonder (Toogood).—A useful lettuce of the Cos type with dark green, self-folding leaves; makes a good heart.

67. Long Standing White (Barr).—Considered undesirable by the Committee in 1909 trial. A large-leaved Cos variety of spreading habit without heart.

68. Paris Grey (Carter).—A large variety, with self-folding dark green leaves; makes a fairly good heart.

69. Peerless (Sutton).—A good lettuce of the Cos type; makes a large, round heart, and remains a long time fit for use.

70. Perfection Dwarf (Barr).—A useful dwarf Cos lettuce, with dark green leaves and a good heart.

71. Romaine Express (R. Veitch).—A dwarf Cos lettuce, with dark green leaves and a fairly good heart; stock not true.

73. Barnum (Barr).—A variety having very large leaves and little heart.

74. Trianon (Barr).—A large Cos lettuce, with light green leaves; fails to make a good heart.

75. Winter Density (Toogood).—A small, dark green Cos lettuce, with a good heart.

76. Winter Giant (R. Veitch).—Considered undesirable by the Committee.

77. Winter Superlative (Toogood).—A useful lettuce of the Cos type, with large, light green leaves.

78. White Heart (Sutton).—A very large lettuce of the Cos type; makes a very large head, and stands well.

79. Sutton's Nonsuch (Sutton).—A small Cos variety, with a good heart.

80. Dwarf Perfection (Sutton).—A Cos variety, with self-folding leaves; does not make a good heart.

BORAGE.

1. Toogood.

CHERVIL.

2, 3. Curled (Toogood, Barr).

DANDELION.

4. Broad-leaved Improved (Barr), **XXX** December 20, 1910.—Leaves 12-15 inches long, and about 3 inches broad, with a few large teeth; rather slow in blanching.

5, 6. Broad-leaved (Sutton, Carter).—Same as No. 4.

7. Early Cabbaging (Toogood).—Shorter and narrower leaves than Nos. 4, 5 and 6, with many large and deep teeth; blanches slowly.

8. Early Improved (Jas. Veitch), **XXX** December 20, 1910.—Similar to No. 4, but did not germinate well.

9. Moss-leaved (Toogood).—Leaves about 12 inches long, deeply toothed almost to midrib; very good blancher.

10. Thick-leaved (Sutton).—Very similar to No. 7; good blancher.

FINOCCHIO.

11. Florence Fennel (Sutton).

NASTURTIUM.

12. Tom Thumb (Toogood).

CRESS.

13, 14, 15. American (Sutton, Barr, Nutting).—Height 6-9 inches; leaves dark green, deeply divided.

16, 17. Australian broad-leaved (Nutting, Barr).—Height 3-6 inches; leaves entire, light green.

18, 19. Australian, or Golden (Toogood, Sutton).—Height 6 inches; leaves entire, very light green; strong grower.

20. Broad-leaved Green (Nutting).—Height 6 inches; leaves entire, very dark green; strong grower.

21. Extra Fine Curled (Sutton).—Height 9 inches; leaves dark green; very finely divided.

22. Extra Triple Curled (Barr).—Height 3-5 inches; leaves very finely divided, dark green; germination bad.

23. Plain (Sutton).—Height 12-15 inches; leaves light green; very vigorous.

24. Plain-leaved (Barr).—Height 6-9 inches; leaves dark green, very finely divided.

MUSTARD.

25. Black, or Brown (Toogood).—Leaves medium, light green, deeply toothed.

26. Chinese (Carter).—Leaves dark green, deeply cut; a good vigorous variety.

27. Chinese large-leaved (Barr).—Leaves medium, light green, slightly toothed.

28. Fringed (Barr).—Leaves small, light green, deeply fringed; not a desirable variety.

29. Giant Curled (Barr).—Similar to No. 27.

30. White (Barr).—A little larger than No. 26, but otherwise very similar; vigorous grower; a desirable variety.

CHICORY.

31, 32. Barbe-de-Capucin (Barr, Sutton).—For description see vol. xxvi. p. 864.

33. Winter Giant (Toogood).

34. Christmas Salad (Sutton).

ORACHE (MOUNTAIN SPINACH).

35. Red (Sutton).—Failed entirely.

36. White (Sutton).—Height 4 feet; leaves pale green, triangular in shape, being 9 inches long and 6 inches broad at the base.

WITLOOF.

37. Brussels Chicory (Sutton), **F.C.C.** January 19, 1876.—For description see vol. xxvi. p. 864.

CHIVES.

38. (Nutting).—Leaves 6-9 inches long, dark green; very good crop.

39. (Sutton).—Failed entirely.

WELSH ONION.

40. (Sutton).—Bulbs good size, firm, brownish-purple skin.

SHALLOT.

41. The Sutton (Sutton).—Bulbs good size; very good cropper; brownish-purple skin.

SORREL.

42. Sorrel (Toogood).—12-15 inches high; leaves about 6 inches long by 2 inches broad, dark green; vigorous grower.

43. Early Improved (Barr).—12-15 inches high, leaves long and broad, light green.

44. French Broad (Barr).—12 inches high; leaves long and broad, pale green; vigorous grower.

45. Large-leaved (Carter).—Leaves long and broad, light green; plants 12-15 inches in height; vigorous.

46. White Large-leaved (Nutting).—Leaves very long and broad, light green; plants 18 inches in height; vigorous grower.

PURSLANE.

47. Purslane (Toogood).—Plants robust and spreading; leaves golden-yellow, and rather small.

48. Barr's Giant Yellow (Barr).—Plants robust and spreading; leaves golden-yellow, of good size.

49, 50. Golden (Barr, Nutting).

51, 52. Green (Nutting).—Plants very robust and spreading; leaves dark green.

BEET.

53. Crimson Ball (Carter).—For description see vol. xxvi. p. 864.

54. Crimson Globe (Toogood).—Root small, but of good shape; dark crimson; foliage short, compact, green, tinged with purple.

55. Crimson King (Gray).—Root long and conical; skin smooth, very dark crimson; size medium; foliage spreading, broad, deep purple.

56. Dainty (Carter).—Roots conical; skin smooth; size medium; foliage small, purple.

57. Excelsior Turnip (Carter).—Root large, globular; skin smooth, dark crimson; size medium; foliage green, tinged with purple.

58. Perfection (Carter), **A.M.** September 17, 1896.—Root long, conical; skin smooth, dark crimson; size medium; foliage small and growth rather weak, dark green, tinged with purple.

59. Globe (Sutton), **A.M.** July 31, 1908.—Root small, globular; skin smooth, dark crimson; size medium; foliage small, short, and broad, dark green, tinged with purple.

60. Blood Red (Sutton), **A.M.** September 29, 1908.—Root small, conical; skin smooth, dark crimson; size medium; foliage long, broad, dark green, tinged with purple; vigorous grower.

CHENOPODIUM.

61. Quinoa (Sutton).—Height 3-4 feet; leaves pale green, usually having a few large teeth, shape varying, but generally roughly triangular, and much smaller than those of No. 62.

62. Amaranticolor (Sutton).—Height 7-8 feet; leaves large, dark green, triangular in shape; young leaves deeply tinged with reddish-violet.

RAMPION.

63. Rampion (Sutton).—Leaves borne in dense tufts 5 inches long and 1½ inch broad. Considerably more than half the plants were in flower in August.

RADISH.

1. Crimson Giant (J. Veitch).—A scarlet turnip-rooted radish having irregularly shaped bulbs and a very pleasant flavour; remains quite solid and firm and fit for use for a considerable time.

2. Denmarn Forcing (J. Veitch).—A scarlet turnip-rooted radish with regular bulbs and a mild flavour.

3. Early White Short-leaved Forcing (R. Veitch).—A white oval radish making small bulbs of a mild flavour. A good variety of the type.

4. Ever Tender (R. Veitch).—A scarlet oblong radish tipped with white and having a very mild flavour.

5. Early Yellow (Barr).—A turnip-rooted radish of nice shape.

6. Early Scarlet Perfection (Toogood).—A scarlet turnip-rooted variety of good shape and size; similar to No. 2.

7. Early Frame, Wood's (J. Veitch), **A.M.** May 10, 1898.—A long scarlet variety tipped with white.

8. Early Red (Barr).—A long scarlet radish.

9. Earliest Frame (Sutton), **A.M.** April 26, 1895.—Similar to No. 7.

10. French Breakfast (Nutting).—A scarlet variety of the type which does not remain fit for use for very long.

11. French Breakfast (J. Veitch).—Scarlet-tipped white; a very good radish of the French Breakfast type.

12. Gem (J. Veitch).—A scarlet turnip-rooted variety similar to No. 2.

13. Long Brightest Scarlet (Nutting), **XXX** July 30, 1910.—A good variety of the Long Scarlet type; dark red tipped with white; bulbs handsome; flavour excellent.

14. Long White Icicle (R. Veitch).—A long white radish and a good variety of the type.

15. Long Rose, White-tipped (J. Veitch).—Similar to No. 7.

16. Long White (Sutton).—Similar to No. 14, and a good variety of the type.

17. Olive, Crimson French Breakfast (Sutton).—A radish of good size and similar to No. 10.

18. Olive, Early Rose (Sutton).—A nice scarlet turnip-rooted radish and a good variety of the type.

19. Olive, Forcing Carmine (Sutton).—A large radish, otherwise similar to No. 2; a good variety of the type.

20. Olive, French Breakfast (Sutton).—Similar to No. 17.

21. Olive, Forcing French Breakfast (Sutton).—Similar to No. 17.

22. Olive, Forcing White (Sutton), **A.M.** May 10, 1898.—A white oval variety, and a good example of the type.

23. Olive, Purple, White-tipped (Barr).—A good-sized radish, dark purple tipped with white.

24. Olive, Scarlet Intermediate (Barr).—Similar to No. 10.

25. Olive, Scarlet First of All (Barr).—A scarlet turnip-rooted variety of nice shape and size.

26. Olive, Scarlet French Breakfast (Barr).—A good scarlet turnip-rooted variety.

27. Olive, White First of All (Barr).—An oval white variety, similar to No. 22 and a good variety of the type.

28. Olive, Jewel (Barr), **XXX** June 30, 1910.—An oblong radish with a white tip and furrowed bulb. It has a very dark green, short top, and is an excellent variety, specially suited for forcing, being so very dwarf.

29. Long, Early White (Barr).—Similar to No. 14 and a good variety of the type.

30. Long, Scarlet Queen (Barr).—Similar to No. 7.

31. Long Triumph Forcing (Toogood).—A long scarlet radish with a white tip; a good variety of the type.

32, 33. Scarlet Globe (Nutting, Sutton).—A scarlet turnip-rooted variety with white tip.

34. The Sutton (Sutton).—A long scarlet radish with a white tip; a good variety of the type.

35. Crimson Gem (Barr).—A scarlet, white-tipped radish similar to No. 2.

36. Earliest of All (Sutton).—Similar to No. 35.

37. Early Rose (Toogood).—A scarlet turnip variety of good size and shape; similar to No. 35.

38. Early Ruby (Toogood).—A large purple turnip-rooted variety having slightly furrowed bulbs.

39. Early Scarlet (J. Veitch).—Similar to No. 35.

40, 41. Early White (J. Veitch, Barr).—A round white radish of nice size and shape; a good variety of the type.

42. Express (Toogood).—A red turnip-rooted radish and a good variety of its type.

43. Giant Crimson Forcing (Toogood).—Similar to No. 35.

44. Red Turnip (Nutting).—Similar to No. 35.

45. Red Forcing (Sutton).—Similar to No. 35.

46, 47. Red White-tipped (Sutton, Nutting).—A large turnip radish which does not remain long in good condition.

48. Scarlet Perfection (Barr).—Similar to No. 35.

49. Speckled Beauty (Toogood).—A white-tipped, red turnip variety speckled with white; stock requires more selection.

50. Triumph (Barr).—Similar to No. 35.

51. White Turnip (Nutting).—A round white radish; a good variety of the turnip type.

52. White Forcing (Sutton).—Similar to No. 51 and a good variety of its type.

53. Black Spanish, Winter (Barr).—The well-known black-skinned winter radish.

54. Munich White (Barr).—A long white radish; a good variety of the type.

55. Scarlet China (Barr).—Similar to No. 35.

Tomato.

1. A 1 (Sutton).—Fruit large, round, smooth, bright red; foliage and habit robust; heavy cropper.

2. Perfection (Sutton).—Fruit large, round, slightly flattened and slightly corrugated; foliage and habit fairly robust; good crop.

3. Main Crop (Sutton).—Fruit medium, round, slightly flattened and slightly corrugated, bright red; foliage and habit robust; crop good.

4. Earliest of All (Sutton).—Fruit medium, round, slightly flattened and slightly corrugated, bright red; foliage and habit weak; crop moderate.

5. Sunbeam (Sutton).—Fruit large to medium, deep round, yellow, smooth; foliage and habit robust; crop good.

6. Princess of Wales (Sutton), **A.M.** August 15, 1905.—Fruit round, slightly flattened, smooth, bright red; foliage and habit robust; good cropper.

7. Day-Dawn (J. K. King).—Fruit large, round, smooth, bright red; foliage and habit robust; crop good.

8. Paul's No. 1 (Fleetwood Paul).—Fruit rather small, round, smooth, bright red; foliage and habit robust; very good crop.

9. Balch's Fillbasket (Balch).—Fruit round, large, bright red, smooth; foliage and habit robust; good tomato, but ripens unevenly.

10. Balch's Ailsa Craig (Balch), **A.M.** August 30, 1910.—Fruit large, slightly flattened, smooth, bright red; foliage and habit robust; very heavy crop (each truss bearing on an average 9 or 10 fruits). Said to be Fillbasket × Sunrise.

11. Balch's Carrick (Balch), **A.M.** August 30, 1910.—Practically the same as No. 10, but said to be Fillbasket × Victor.

12. Balch's Ayrshire (Balch), **A.M.** August 30, 1910.—Practically the same as No. 10, but said to be Fillbasket × Lister's Prolific.

13. Satisfaction (Sutton), **A.M.** August 15, 1905.—Fruit round, large, smooth, bright red; foliage and habit robust; crop heavy.

14. Abundance (Sutton).—Fruit round, small, slightly flattened and slightly corrugated; foliage and habit robust; crop good.

15. Sutton's Open Air (Sutton).—Fruit round, slightly flattened, large, corrugated, bright red; foliage and habit robust; crop fair.

16. Market Favourite (J. H. King).—Fruit round, large, smooth, bright red; foliage and habit robust; crop good.

17. Sutton's Garden Perfection (Sutton).—Fruit round, slightly flattened, large, yellow, smooth; foliage and habit robust; crop good.

18. Best of All (Sutton).—Fruit round, slightly flattened, large, smooth, bright red; foliage and habit fairly robust; crop fair.

19. Lord Roberts (J. H. King).—Fruit round, smooth, fairly large, bright red; foliage and habit robust; crop fairly heavy.

20. Veitch's Invicta (J. Veitch).—Fruit round, large, slightly corrugated, bright red; foliage and habit robust; crop good.

21. Sutton's Magnum Bonum (Sutton).—Fruit round, slightly flattened and slightly corrugated, large, and bright red; foliage and habit fairly robust; crop fair.

22. Early Market (Sutton).—Fruit round, small, smooth, bright red; foliage and habit fairly robust; crop medium.

23. Churchman's Seedling (Churchman).—Fruit round, slightly flattened, smooth, medium, bright red; foliage and habit rather weak; crop fairly good.

24. Golden Nugget (Sutton), **F.C.C.** August 14, 1894.—Fruit small, smooth, round, yellow; foliage and habit robust; crop heavy.

25. Ornamental Tomato, Cascade (Sutton).—Fruit round, smooth, bright red; foliage and habit robust; crop good.

26. Harrison's Fillbasket (Harrison).—For description see vol. xxxv. p. 497.

27. Dwarf Gem (Sutton).—Fruit round, medium size, slightly flattened and slightly corrugated, yellow; foliage and habit robust; crop good.

28. Winter Beauty (Sutton), **A.M.** April 18, 1899.—Fruit round, slightly flattened and slightly corrugated, large, bright red; foliage and habit robust; crop good.

29. Eclipse (Sutton).—Fruit round, large, bright red; foliage and habit robust; crop good; a good tomato, but ripens unevenly.

SUMMER SPINACH AT WISLEY, 1910.

TWENTY-ONE stocks of Summer Spinach were received for trial, all of which were sown on March 22, in rows 18 inches apart, and when the plants were large enough they were thinned out in the rows. 'Long Standing' and 'Triumph' were particularly fine stocks, standing better than any others. *Chenopodium amaranticolor* was sent in as a salad, but it proved an excellent and most productive vegetable. Cooked in the same way as ordinary Spinach, it was tender and delicious, somewhat resembling the flavour of young nettles when cooked.

1. *Chenopodium amaranticolor* (Kew).—(See salad report, p. 741).

2. Bloomsdale (Barr).—An early variety of Victoria Spinach, with narrow and pointed leaves; runs to seed very quickly.

3. Broad Flanders (Barr).—A variety with small pointed leaves; not worth growing.

4. Early Versailles (Barr).—An early variety of Victoria Spinach, with large, dark-green leaves; coming into use quickly.

5. Evergreen Summer (Barr).—Leaves of moderate size, dark green and pointed; growth tall; rather liable to run to seed.

6. Lettuce-leaved (Barr).—Leaves large, dark green, long and pointed at tip; comes into use very quickly; a good Spinach.

7, 11. Long-standing (Cannell, Sutton).—Leaves very dark green and of good size and substance; stands well; an excellent Spinach.

8. Long-standing, round (J. Veitch).—Very similar to No. 7.

9. Long-stander (Barr).—Similar to No. 7.

10. Long-standing (Nutting).—Very similar in all respects to No. 7, but an inferior stock.

12, 14. Round or Summer (Dobbie, Sutton).—Leaves large, dark green, of good size and substance, somewhat round in shape; a good Spinach.

13. Round or Summer (J. Veitch).—In all respects similar to No. 12, but a much better stock.

15, 16. Thick-leaved (Barr).—Leaves dark green, of fair size and substance; a good Spinach.

17, 18, 19. Triumph (Nutting, Sutton, J. Veitch).—Leaves a very dark green, of good size and substance; an excellent Spinach.

20. Victoria (Nutting).—Leaves dark green and somewhat pointed; of a good size and substance.

21. Victoria Improved (Dobbie).—In all respects similar to No. 18, but leaves a trifle larger.

MISCELLANEOUS VEGETABLES AT WISLEY, 1910.

Brussels Sprouts.

Pyramid (Gray).—Sprouts large, hard; plants dwarf with a good spread of foliage; sprouts many and close together.

Carrot.

Gray's re-selected Early Market (Gray).—Roots from 3-4 inches long, well shaped.

Improved Early Market (Gray).—Roots small and rather badly shaped. Crop badly attacked by fly.

French Bean.

Climbing Erfurt Bush (Harrison).—Haulm 7 feet high, dark green; flowers creamy-yellow; pods 5 inches long, pale green; plants robust.

Helianthus.

Roots long and tapering, 12-15 inches long; very like a Jerusalem artichoke; smooth; has a taste very like an artichoke.

Kale.

Labrador (Laxton), 18 inches high.—Sturdy, green, foliage broad.

Leek.

Superb (Gray).—Plants sturdy, thick, growth very compact.

Melon.

1. Golden Beauty (Barr), **A.M.** August 30, 1910.—Fruit medium, averaging about 3½ lb.; each plant carrying four fruits, oval, lemon-yellow in colour, heavily netted, flesh thick, scarlet, and of good flavour.

2. Mauldslie Castle (Barr), **A.M.** September 13, 1910.—Fruit of medium size, about 4 lb. each, oval in shape, greenish yellow skin, irregularly netted, strong grower, free setter, arriving at maturity late.

3. Hero of Lockinge (Smith).—For description see vol. xxxiii. p. 283.

4. Trent Park Perfection (Parr).—Fruit medium, averaging 2 lb., straw colour; seed badly mixed.

5. Tonbridge Green (Davies), **A.M.** September 13, 1910.—Fruit very large, skin greenish yellow, slightly netted, flesh deep, pale green, remarkably sweet and melting.

6. Early Favourite (Smith), **A.M.** August 16, 1910.—Fruit large, averaging about 6 lb. each, oval, slightly ridged and heavily netted, straw colour; flesh green, thick, of excellent flavour, arriving at maturity a fortnight before any of the others.

ONION.

Improved White Spanish (Gray) and Cream Globe (Gray).—Both these onions were badly attacked by the onion fly and rendered useless.

PARSNIP.

Early Short Round or Turnip-rooted (Barr).—Useless as a turnip rooted variety; cankered badly.

New White Marrow (Barr).—Root 12 inches long, good shape, smooth; cankered rather badly.

Hollow Crown Improved (Barr).—A good form of the Hollow Crown variety.

Student (Barr).—Same as Hollow Crown.

REPORT ON APPLIANCES, &c., AT WISLEY, 1910.

Insecticide No. 1 and No. 2 (E. P. Bidwell).

A good insecticide when used according to instructions.

Demon Insecticide (Boundary Chemical Co.).

A useful insecticide for general purposes.

Lytle's Arsenate of Lead (Boundary Chemical Co.).

To be recommended for spraying fruit trees that are attacked by leaf-eating and boring insects.

Izal Veterinary Fluid (Newton Chambers & Co.).

A useful preparation for disinfecting the stable, kennel, &c.

Izal (Newton Chambers & Co.).

An agreeable disinfectant for lavatory, bathroom, &c.

Eclipse Fish Manure (Humber Fish Manure Co.).

An excellent manure for carnations, Cannas, &c., and if dissolved in water can be used to advantage for all soft-wooded plants.

Climax Weed Killer (Boundary Chemical Co.).

The readily soluble powder proved an effective weed-killer at the strength recommended on the packages.

Slatter's Lawn-Edge Cutter (Slatter).

By means of this ingenious device attached to the side of an ordinary lawn mower edging will be facilitated, and labour saved to a great extent. The apparatus when in gear (it can be placed out of gear at will) consists of a revolving wheel knife-edge which cuts the overhanging grass at the edge without disturbing the underlying soil, while the mower does its work on the level. The knife-edge is protected by a piece of metal like a plough which prevents the cut particles of grass being thrown far from the edge. This piece of metal and a solid revolving wheel in front keep the machine in line, and in rounding curves these parts are adjusted accordingly with a butterfly screw.

Lever's Patent Dandelion Extractor (Lever).

A very useful tool, which does its work on the vacuum principle exceedingly well. It consists of a tubular piece of steel with a serrated cutting edge, a plunger like a pump in the inside, and a right-angled handle. When placed over the dandelion and pressed into the grass about three inches deep, the plunger is then forced through the top of the handle, producing a vacuum between the base of the plunger and the top of the dandelion, which is drawn up into the tube. When pulled from the ground the plunger is pressed down to eject the root. It is also most useful for planting bulbs, as the soil is drawn out to the

depth required, and, after planting, the turf is returned to its former position, and the lawn left as before.

The Holder Compressed Air Sprayer (Hartjen & Co.).

A well-made copper knapsack compressed air sprayer with pump and pressure gauge attached. It can be easily filled and manipulated and gives a good mist-like spray, but the tube supporting the nozzle is too short for safe use with caustic washes.

Syringe (Boundary Chemical Co.).

This is an excellent syringe fitted with a suction pipe of rubber intended to dip into a pail standing on the greenhouse floor, so that time may be saved in spraying or syringing. It would be useful in a small greenhouse, but we think there are handier pieces of apparatus for the purpose of spraying. The nozzle delivers a fine spray.

Four Oaks Knapsack Sprayer (Four Oaks Company).

We have already favourably reported upon this excellent machine (vol. xxxiv. p. 553.) The form now reported upon includes several small improvements upon the older one tending to greater efficiency in working. The working parts are all easily reached and very simple. The machine is so well made that it can scarcely get out of order, and if it does it can be repaired with little loss of time. It is difficult to see where improvements in this type of machine could be made, for the principle of it, the materials, and the workmanship are of the best. The nozzles, which are interchangeable with those of the larger machines, are of various types for different grades of work, and are very efficient.

Four Oaks Spraying Machine (Four Oaks Company).

Where a larger machine is required this oak tub mounted on a large-wheeled, wide-tyred carriage, fitted with a strong and powerful pump, and an efficient agitator is just the thing required. Its width enables it to be used between rows of bush fruits, and its mechanism, together with the excellent nozzles made by this firm, equalling, if not surpassing, the best our American cousins, who have studied the question of spraying so largely, have produced, fit it for all sorts of efficient fruit-tree spraying.

DONORS OF SEEDS, PLANTS, TREES &c., TO THE SOCIETY'S LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1910.

ANDREWS, W., Truro. *Triteleia laxa purpurea.* Planted in garden.
AUBIN, P., Jersey. Seeds of Pentstemon.
BAKER, L., S. Africa. Seeds of *Protea grandiflora.* Not yet germinated.
BALCH, A., Girvan. Tomato seed. See p. 743.
BARBIER, Messrs., Orleans. Wichuraiana roses. Planted in the garden.
BARR, Messrs., Covent Garden. Potatos (see p. 726); peas (see p. 708); collection of seeds (plants raised); salads (see p. 732); spinach (see p. 745); melons (see p. 746); parsnips (see p. 747); gladioli (see p. 688); collection of seeds from Sikkim (not yet germinated).
BARTLETT, A., Washaway. *Cupressus funebris* and *Taxodium distichum mucronatum.* Seed of *Abies brachyphylla* × *A. Webbiana.* Planted in garden.
BATES, H. Robertsbridge. Potatos. See p. 726.
BEES, Messrs., Liverpool. Potatos. See p. 726.
BIDWELL, Messrs., London, E.C. Insecticides. See p. 748.
BIRCH-REYNARDSON, Miss, Newbury. Hybrid rose. Planted in the garden.
BIRKBANK, Miss, Putney. Hill's 'Eden.' Added to the Library.
BLACKMORE, J., Allerford. Potatos. See p. 726.
BOARD OF AGRICULTURE, Memoirs of Rothamsted Expt. Station. Added to Library.
BODDINGTON, A., New York. Asters. See p. 702.
BOOTH, N., Lincoln. Potato 'Lemon Kidney' (see p. 726); and Pea 'Booth's Seedling.' See p. 715.
BOUNDARY CHEMICAL Co., Liverpool. Horticultural sundries. See p. 748.
BOURNE, R. W., South Kensington, S.W. Weeping Willow from Napoleon Bonaparte's grave. Planted in garden.
BOWER, B. A., Chislehurst. *Potentilla rupestris.* Planted in the garden.
BOWLES, E. A., Waltham Cross. *Petasites japonicus giganteus.* Planted in garden.
BRASSEY, Hon. Mrs., Heythrop. *Parochetus communis.* Planted in garden.
BREWER, G. W. S., Nailsworth. Potato 'Walker's Seedling.' See p. 726.
BROOKS, W., Haslemere. Vine eyes.
BROWN, A. F. G., Freshwater. *Cosmos* 'Lady Lennox' and *Solanum aviculare.* Collection of seeds. Plants raised for distribution.
BROWN, G., Hull. Raspberry canes. Added to the collection.
BRYAN, Major G., Alton. Collection of dried plants from S. Africa. Added to Herbarium.
BULLEN, Mrs., London, W. Tubers of New Helianthus. See p. 746.
BUNYARD, Messrs., Maidstone. Michaelmas Daisies. Added to the collection. Strawberry runners. Planted in the trial.
BURRELL, Messrs., Cambridge. Gladioli. See p. 688.
CAMBRIDGE BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
CANNELL, Messrs., Norwich. Lettuce and spinach (see p. 734); peas (see p. 708); and potatos (see p. 726).
CARR, Admiral, Chertsey. Seed of white *Gentiana Pneumonanthe.* Not yet germinated.
CARTER, Messrs., High Holborn. Peas (see p. 726); salads (see p. 732).
CHAMBERS, H., Tunbridge Wells. Potato 'Chambers' Prima Donna.' See p. 726.
CHANING-PEARCE, Dr., Ramsgate. *Phragmitis communis aureo marginata.* Planted in garden.
CHELSEA PHYSIC GARDEN. Collection of seeds. Plants raised for distribution.
CHURCHMAN, H. W., Sawston. Tomato 'Churchman's Seedling.' See p. 743.
CLIBRANS, Messrs., Altrincham. Coloured flowered edible pea. See p. 708.
CLUTTON-BROCK, A., Godalming. *Campanula Stansfieldii, C. Tommasiniana, Viola gracilis, Wahlenbergia graminifolia.* Planted in the garden.
COLES, A. H., London, W. *Crinum Rattrayi.* Arrived in a state of decay.
COLLISON, T., South Norwood. Collection of seeds from Colombia.
COLLYER-BRISTOW, Mrs., Croydon. Seed from Brazil.
CORREVON, Monsieur H. Seeds of alpine plants. Plants raised for distribution.
COWAN, A., Penicuik. Cuttings of Willow with coloured stems. Growing on in the garden.
CRACOW BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
CRUMP, W., Malvern. Apple 'Wm. Crump.' Added to collection.
DAVIES, T. W., Purley. *Hoheria populnea.* Not yet germinated.

Davies, W., Tonbridge. Melon 'Tonbridge Green' (see p. 746); potatos (see p. 726).
Dean, A., Kingston. Pink sport from old crimson clove pink.
de Courcy, F. A., Somerset East, South Africa. Tuber of scented Dahlia. Seeds from Nyassaland and Cape Colony. Not yet germinated.
Dew, A. A., Coalville. Potato 'Dew's Favourite.' See p. 726.
Dobbie, Messrs., Edinburgh. Sweet peas. Grown in the garden.
Douglas, J., Bookham. *Cypripedium Leeanum.* Added to collection.
Du Croy, Mrs., Weybridge. Collection of seeds.
Duncan, G. S., Campden. Plant growing on, not yet flowered.
Dunedin Botanic Garden. Collection of seeds. Plants raised for distribution.
Earle, Mrs., Cobham. Seeds of *Statice brachypoda, S. imbricata, S. macrophylla.*
Elwes, Miss, Cirencester. Seeds of *Melampyrum nemorosum.* Not yet germinated.
Etherington, A., Lewisham Hill. Cucumber seed.
Evans, J. Spencer, Newbury. Seed of Canadian Maple, seed of *Camellia Thea*, seeds from Assam. Plants raised.
Francher Creek Nurseries, California. Collection of Plums and Walnuts. Added to collection.
Fenwick, G., Stamford. *Lychnis hybrida.* Planted in the garden.
Fisher, J. H., Sittingbourne. Strawberry 'La Merveille de France.'
Flemyng, Rev., Waterford. Seeds of *Pyrus Sargentii.* Not yet germinated.
Forbes, J., Hawick. Collection of seeds of annuals, &c. See p. 702.
Four Oaks Co., Sutton Coldfield. Knapsack and large spraying machines. See p. 749.
Gibbs, Hon. V., Elstree. Collection of shrubs, &c. raised from seed sent home by Mr. Wilson from N.W. China. Planted in garden.
Gibson, Mrs., Aldershot. Seed of a purple lily. Failed to germinate.
Glendenning, R., Vancouver, B.C. Seeds from British Columbia.
Godwin-Austen, Mrs., Godalming. Viola 'Red Velvet,' Nore Variety. Planted in the garden.
Gray, Z., Sandy. Vegetable seeds (see p. 746), seed of 'Fancy Pansy.'
Green, A., Sydney, N.S.W. Seed of dwarf aster. Growing on.
Green, R. W., Wisbech. Potato 'Ashleaf.' See p. 726.
Hanbury, Lady, Ventimiglia, Italy. Collection of seeds. Plants raised for distribution.
Harris, J., Swansea. Potatos. See p. 726.
Harrison, Messrs., Leicester. Vegetable seeds. See p. 746.
Hartjen, Messrs., London, E.C. The 'Holder' Compressed Air Sprayer. See p. 748.
Haviland, Miss, St. Leonards-on-Sea. Conifers. Added to collection.
Helme, B. M., Cobham. *Thalictrum adiantifolium.* Divided for distribution.
Henslow, Rev. Prof., Leamington. Framed portrait of Mr. Veitch for the Council Room at Wisley.
Hicks, Mrs., Newquay. Cuttings of a double Wallflower.
Hill, D., Watford. Helianthemum 'The Bride.' Planted in garden.
Holmes, W. G., Tain. Peas. See p. 708.
Hopkinson, Mrs., Wimbledon Common. Cuttings of *Cistus formosus.* Growing on.
Hudson, J., Acton, W. *Amaryllis Belladonna maxima.* Planted in garden. Late Dutch Honeysuckle. For trial.
Humber Fishing and Fish Manure Co., Hull. 'Eclipse' Fish Manure. See p. 748.
India, Agricultural and Horticultural Society of, Calcutta. Cannas and seeds. Growing on.
Jalland, H., Horncastle. Collection of seeds from New Zealand. Not yet germinated.
James, J., Redditch. Pea 'The Birchfield.' See p. 708.
Jekyll, Miss, Godalming. *Rosa sempervirens.* Planted in the Wild Garden.
Jeyes' Sanitary Compounds Co., Cannon Street, London. Jeyes' Horticultural Wash.
Jones, Messrs., Lewisham. Collection of Asters. Planted in the garden.
Kay, A., Bournemouth. Seeds of Barberton Daisy. Failed to germinate.
Kelway, Messrs., Langport. Gladioli. See p. 688.
Kemp, R., Saffron Walden. Potato. See p. 726.
Kew, Royal Botanic Gardens. Collection of seeds. Plants raised for distribution.
King, J. K., Coggeshall. Tomatos. See p. 743.
King, Miss, Wotton-under-Edge. *Cynoglossum amabile.* Plants raised for distribution.
Knight, W., Hailsham. Raspberry 'Hailshamberry.' Added to the collection.
Lawrence, Sir Trevor, K.C.V.O., V.M.H., Burford. *Anthurium Scherzerianum burfordiense*, growing on. Collection of Orchids. Small collection of Anthuriums. Cuttings of *Buddleia variabilis superba*, growing on. Seeds of *Codonopsis Tangshen, Isatis glauca, Lilium giganteum yunnanense*, and *Nicandra physaloides* for distribution.
Laxton, Messrs., Bedford. Peas (see p. 708); Kale, 'The True Labrador' (see p. 746); Raspberry 'Laxton's Perpetual,' added to the collection.

Ledger, W. E., Wimbledon. Collection of Ceropegias. Growing on.
Leverett, A. F., Ealing. Collection of dried British plants. Added to Herbarium.
Leigh, J., Tonbridge. Potato 'Ash-top Fluke.' See p. 726.
Lloyd, S., Droitwich. Potato 'Hale's Early.' See p. 726.
Longstaff, Mrs., Wimbledon. Collection of seeds. Orchids from Rhodesia. Added to collection.
Lowndes, Miss, Shillingstone. Seed of *Incarvillea grandiflora*. Plants raised for distribution.
Magor, E. J., St. Tudy, R.S.O., Cornwall. *Cistus vaginatus*, *Erica codonodes*, *Rhododendron Ungernii*, *Rhododendron rubiginosum*, and *Rhododendron Smirnowi*. All growing on for distribution.
Manvell, G. S., Croydon. Irises. Planted in garden.
Marker, Hon. Mrs., Combe, Honiton. Seeds of a pale blue variety of *Meconopsis aculeata* collected in N.W. India. Not yet germinated.
Maryon-Wilson, Miss, Blackheath. Seeds from India. Failed.
Massee, G., Kew. Book for Library.
McKinlay, G., Ampthill. Cabbage plants. Planted in the garden.
Micheli, B. T., Rochester. Irises from the Shan States. Planted in garden.
Miller, G., Wisbech. Potato 'Norfolk Champion.' See p. 726.
Mitchell Cotts, Messrs., 4 London Wall Buildings, London, E.C. Bulbs of *Lilium Harrisii* grown in South Africa. Growing on in the greenhouse.
Moore, F. W., Bedford. Potato 'Bedowin.' See p. 726.
Moseley, Mrs., South Croydon. Seeds of *Ipomoea rubro-coerulea* from the Cape. Growing on.
Newton Chambers, Messrs., Sheffield. 'Izal' Disinfectant. See p. 748.
Nutting, Messrs., 106 Southwark Street, London, S.E. Salads. See p. 688.
Pfitzer, W., Stuttgart. Gladioli. See p. 688.
Philbrick, Miss, Halstead. Seeds from S. Nigeria and Algeria.
Phillpotts, Mrs., Torquay. Seedling Bamboo. Planted in the garden.
Piesse, Miss, Upper Norwood. 'The Natural History of Plants,' by Kerner and Oliver. Added to the Library.
Platten, E. J., Lowestoft. Tomato 'Smart's Finality' for trial in 1911.
Pocock, Messrs., Hendon. Potatos. See p. 726.
Powell, W. S., Whitland, S. Wales. Potatos. See p. 726.
Pryce, R., Sutton. Collection of seeds. Plants raised for distribution.
Richmond, Mrs., Lustleigh. Collection of seeds. Plants raised for distribution. Some seed failed.
Robinson, Messrs., Kirkby Lonsdale. Potatos. See p. 726.
Robson, R. McK., Aberdeen. Collection of vegetable seeds for museum.
Rollit, Sir Albert, Chertsey. Lettuce. See p. 737.
Ross of Bladensburg, Sir J., Dublin. *Billardiera longiflora*, *Callitris oblonga*, *Eucryphia pinnatifolia*, and *Sollya heterophylla*. Raised for distribution. Some seed failed.
Rothschild, Lord, Tring. Collection of Hippeastrums. Distributed to Fellows.
Salwey, T. J., Old Charlton. Seeds from Madeira. Potato. See p. 726.
Sandeman, J. G., Havant. Collection of seeds. Cuttings of *Fagus antarctica*. Growing on.
Sander, Messrs., St. Albans. *Dendrobium nobile*. Added to the collection.
Saunders, Mrs. Edwd. Collection of economic insects, drawings and notes. Added to collections and Library.
Schröder, Baron Bruno, Egham. Collection of Orchids. Added to collection.
Schuster, Rev., West Lulworth. Violets. Planted in garden.
Scott-Elliot, G. F., Newton, Dumfries. Potato 'Early Midlothian.' See p. 726.
Seton, Mrs., Holland Park, W. Seeds from S. Nigeria.
Slatter, G., Nottingham. Lawn-edge cutter. See p. 748.
Smiles, T. E., Wilmington. Strawberry 'Excelsior.' Growing on.
Smith, Messrs. F., Woodbridge. Peas. See p. 708.
Smith, Messrs. Aberdeen. Potato 'Faithlie.' See p. 726.
Staples, H. C., Swanley. Strawberries. Growing on.
Stedman, Mrs., Wimbledon. Gladiolus corm. Growing on, but has not flowered yet.
Steward, Messrs., Nottingham. Potato 'Golden Nugget.' See p. 726.
Stewart, Mrs., Gatehouse. Seeds.
Sutton, Messrs., Reading. Peas (see p. 708); salads (see p. 732); lettuce (see p. 734); cabbage 'Sutton's Harbinger.' Plants raised and growing on in the garden.
Sydenham, Messrs., Birmingham. Peas (see p. 708); lettuce (see p. 734).
Taylor, G., Ferrybridge. Potato 'Early Reliance.' See p. 726.
Taylor, G. M., St. Ninians. Potato 'Duchess of Buccleugh.' See p. 726.
Taylor, Mrs., Henley-on-Thames. Seeds. Not yet germinated.

Thornycroft, Mrs., Lympstone. New Lobelia. See p. 705.
Tidy, A., Cobham. Potato 'Beauty of Braywick.' See p. 726.
Tod, H. M., London. Vines. Planted in the Vineyard.
Toogood, Messrs., Southampton. Salads. See p. 732.
Topham, Mrs., Ripley, Natal. Seeds. Not yet germinated.
Troyte-Bullock, Mrs., Yeovil. Seeds of pink and white Water Lily. Not yet germinated.
Tulk, Mrs., Chertsey. Collection of seeds. Raised for distribution. Some not germinated.
United States Department of Agriculture. Wild Blackberries from Chile, *Rubus spectabilis*. Not yet germinated.
Veitch, Messrs. J., Chelsea. Peas (see p. 708); salads (see p. 732); miscellaneous annuals (see p. 702); collection of plants and shrubs, planted in the garden. Crimson silk table corn from British Columbia.
Veitch, Messrs. R., Exeter. Gladioli (see p. 688); potatos (see p. 726); peas (see p. 708); salads (see p. 732); annuals (see p. 702); rhododendrons, growing on.
Vienna Botanic Garden. Collection of seeds. Plants raised for distribution.
Vilmorin-Andrieux et Cie., Paris. Gladioli. See p. 688.
Wallace, Messrs., Colchester. *Meconopsis Wallichii*. Planted in the garden.
Walpole, E., Rathnew. Seeds. Plants raised for distribution.
Warburton, J. W., Jersey. Collection of seeds. Strawberry 'M. Fournier.' Growing on.
Ware, Messrs. W. T., Bath. Tulip 'Inglescombe Yellow' and Narcissus 'Dubloon.' Planted in the garden.
Wartmann, H., Lachen-Vonwil, Switzerland. Seeds of various Gentians. Not yet germinated.
Warton, Mrs., Elstree. *Funkia*. Planted in the garden.
Waterer, Messrs., Bagshot. Rhododendrons. Planted in the garden.
Webb, G. E., Hitchin. Journal of the Royal Horticultural Society.
Welham, A. H., Bridgnorth. Chrysanthemum 'A. Welham.'
Wells, Miss, Petersfield. Seeds for distribution.
Wheeler, Messrs., Gloucester. Cabbage seed. Growing on.
White, E. A. Fungicide. To be tried in 1911.
Wigan, A. L., Windsor. Collection of Crotons. Growing on.
Wilks, Rev. W., Shirley. *Zephyranthes carinata*. Growing on for distribution.
Williamson, J. F., Mallow, Cork. Potatos. See p. 726.
Willmott, Miss, Great Warley. Collection of seeds. Small collection of Orchids. Plants raised for distribution.
Wilson, E., Oundle. Potatos. See p. 726.
Woodhouse, Dr., Esher. Collection of seeds from Australia and New Zealand.
Woodward, R., Bewdley. Seedlings of *Pittosporum tenuifolium*, *P. Buchanani*, and *P. Ralphii*. Growing on.
Wyndham, Miss, Chelsea. *Thysanotus junceus*. Not yet germinated.
Yates, W. H., Alton. Raspberry 'Rotherfield Supreme.' Added to the collection.
Yokohama Nursery Co., Kingsway, W.C. Gladioli. See p. 688.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

JUDGING by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 756, 757.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
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Veitch, Harry J., F.L.S., F.Z.S., F.R.H.S.
Voss, W. A., F.C.S., F.R.H.S.
Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bulletino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mendel Journal	Mendel Jour.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.

Journals, &c.	Abbreviated title.
Orchis	Orchis.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abies pectinata, On the Distribution of the Wood-parenchyma in. By L. Kny (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 645-648).—The wood of the stem of *Abies pectinata* differs from that of *Picea excelsa* and *Larix europaea* in that resin passages only rarely occur in it. The wood parenchyma which in the last two species accompanies the resin passages is found in the silver fir on the borders of the annual wood rings. Kny's researches show that the wood parenchyma is not equally distributed in all parts of the plant. In the inner annual rings of the primary shoot wood-parenchyma is either entirely absent or occurs only very much more sparsely than in the outer rings. It was also found to be absent in the normal wood of all the lateral branches and of the root.—*R. B.*

Acanthopanax Henryi (*Bot. Mag.* tab. 8316).—Nat. ord. *Araliaceae;* tribe *Schefflereae.* West China. Shrub, 5 feet high; leaves 5-, rarely 3- foliate; umbels clustered at the end of branches; flowers green; berries black.—*G. H.*

Achilleas for the Alpine House or Rock Garden. By W. I. (*Garden*, May 21, 1910, p. 254; 2 figs.).—Many of the dwarfer species are useful for these purposes, and some having silvery foliage are beautiful when not in flower. They may be increased by division or cuttings taken in July in pots. To make a good pan four or five plants should be used in each pan. The following are recommended:—*A. ageratifolia* (=*Anthemis Aizoon*) produces rosettes of silvery leaves with crimped margins; the flowers are pure white with a yellow disc, borne singly on stems 6 inches long. *A. argentea* has silvery toothed leaves and pure white flowers in umbels on stems 6 inches long. *A.* × *Kellereri* has long, narrow, finely toothed leaves in a compact rosette, from which silvery stems 9 inches long bear white flowers in corymbs; the flowers are lasting and attractive. It is a hybrid between *A. ageratifolia* and *A. lingulata*. *A. nana* has leaves in green rosettes, and white flowers. *A. rupestris* makes a carpet of green and dwarf foliage, and bears ivory-white flowers on 4-inch stems. *A. sericea* is like *Kellereri*, but more compact. *A. umbellata* is almost shrubby, and has silvery foliage deeply lobed. *H. R. D.*

Agave Franzosini (*Bot. Mag.* tab. 8317).—Nat. ord. *Amaryllidaceae;* tribe *Agaveae.* Mexico or Central America. Rosette 15 feet wide, 11 feet high; leaves 7½ feet long; inflorescence 40 feet high; perianth, brightish yellow.—*G. H.*

Agricultural Clubs, Boys' and Girls'. By F. W. Frome (*U.S.A. Dep. Agr., Farmers' Bull.* 385, Feb. 1910).—This bulletin concerns a movement which has made great growth of late years in America. The clubs are associations of boys and girls during their years at school, who enter into competitions with each other in various country industries—the boys in growing corn, potatos, fruit, and garden produce; the girls in bread-making, sewing, or, in joint contests with the boys, in gardening or poultry-raising.

In some cases the clubs have been started and fostered by local school managers, in some by State Agricultural Colleges, Young Men's Christian Associations, the U.S.A. Dep. Agr., local public bodies, or by private enterprise.

Helpful leaflets and publications on all the varieties of work undertaken have been published for the use of the clubs by the State Departments, prizes are offered by county associations or by leading residents, and the results of the movement are said to have been educationally beneficial both to children and parents in many ways.—*M. L. H.*

Aleyrodidae, A New Genus of. With Remarks on Aleyrodes nubifera Berger, **and A. citri** Riley and Howard. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Tech.* ser. 12, pt. ix., Sep. 1, 1909; 2 figs.).—The new genus is described as *Paraleyrodes*, and has wing venation of *Aleyrodes* and pupa-case of *Aleurdicus* type.—*V. G. J.*

Alkaline Soils, Experiments with Nitric Acid on. By R. S. Symmonds (*Agr. Gaz. N.S.W.* March 1910, pp. 257-266; 11 figs.).—Soil irrigated by bore-water containing sodium carbonate for some years becomes infertile. Sprinkling with nitric acid (600 lb. to the acre) diluted with water restores the fertility.—*S. E. W.*

Aloe spicata. By H. Strauss (*Gartenflora*, vol. lix. pt. xv. pp. 316-317; 1 col. plate).—The only specimen of this *Aloe* in Europe, flowered at Dahlem in February 1910. The long spike is covered with orange-coloured blossoms.—*S. E. W.*

Alstroemerias (*Gartenflora*, vol. lix. pt. xxii. p. 502).—Alstroemerias require good, well-drained soil in a half-sunny position. The roots should be planted about 10 inches deep. The best worth growing are *A. versicolor*, with red and yellow flowers; *A. aurantiaca*, orange splashed with red; A. pulchella is only suitable for pot cultivation.

S. E. W.

Anchusa italica. By E. C. Pooley (*Garden*, Aug. 27, 1910, p. 423).—The propagation of varieties such as 'Dropmore' and 'Opal' may be effected at the end of August by cutting the fleshy roots into pieces like Seakale sets, and dibbling them into seed boxes filled with soil so that a slight layer of soil covers the tops. They should then be placed in a cool frame and remain there till a fair amount of growth has been made.—*H. R. D.*

Anisophylly, Contributions to our Knowledge of. By E. Heinricher (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 649-664; 6 plates).—Several new cases of anisophylly (*i.e.* unequal leaves developed on the two sides of an obliquely-growing shoot) are reported in this paper. The tropical species *Oreocnida major* Miq., *Mallotus floribundus* Muell, *Macaranga tomentosa* Wight, *Pangium edule* Reinw., and *Hevea brasiliensis* Muell, are first dealt with. The author then adds some further remarks to his former account (1907) of the occurrence of a rare case of anisophylly in the mistletoe. The concluding section of the paper is occupied with an interesting description of the unequal development of leaves on the two sides of plants of *Sempervivum*. If plants of *Sempervivum*, growing on the side of a sloping bank facing west or south, be observed it will be seen that the upper leaves of the rosette—viz. those lying highest on the bank—are considerably larger than the lower leaves. Heinricher's experiments indicate that the inequality in the size of the leaves depends upon their uneven illumination. He does not believe, however, that light, as such, is the active factor in evoking the phenomenon, but that the heat which accompanies the light is the true cause. The upper leaves (and the ground around them) are much more warmed by the direct insolation than the more shaded lower leaves, and thus the growth of the former is favoured.—*R. B.*

Antirrhinum, A Giant (*Rev. Hort.*, March 1, 1910, p. 100).—Description of a giant Antirrhinum which was given to the Botanical Gardens in Upsala as having originated from a seed of a plant of ordinary size. The first season it reached a height of about 4 feet; but, having been preserved in a cold-house during the winter, it reached a height of no less than 11 feet the next season, with exceptionally large flowers of a deep reddish-purple.—*C. T. D.*

Aphis Wash Formulas Recommended. By M. E. Zacharewicz (*Pom. Franç.* Feb. 1910, p. 55).—Summer treatment, applied preferably in morning.—Soft soap 3 kilos., dissolved in 25 litres boiling water; paraffin 2 litres, poured slowly into the preceding solution; water to make the total 100 litres. Winter treatment, at end of January. —Soft soap 1 kilo., paraffin 4 litres, sulphate of copper 1 kilo. to 100 litres of water; mix as previously recommended.—*C. H. H.*

Apiculture, The Status of, in the United States. By E. F. Phillips, Ph.D. (*U.S.A. Dep. Agr. Bur. Entom., Bull.* 75, pt. vi., Jan. 25, 1909).—The bulletin deals largely with the sources of loss to the bee-keeping industry, and the necessity for scientific and economic research.

Of the former, contagious diseases demand most attention, although swarming, winter loss, and waste of wax are important items which must not be overlooked.

The author considers that agriculture as an industry is benefited only by the making of expert bee-keepers financially interested in the

business. Those only slightly interested are a serious detriment to the industry, especially in regions where bee diseases exist.—*V. G. J.*

Apple Culture: Selection of Stock. By G. T. Powell (*U.S.A. Hort. Soc. Vermont, 7th Ann. Rept.* 1909, pp. 26-28).—The writer advises the application of the principles of horse-breeding to the raising of orchard trees, each one of which has an individuality of its own. He recommends purchasing maidens of a given variety and growing them under close observation for two or three years, after which those which are the most vigorous and healthy and the most productive of the finest quality of fruit should be selected and buds taken from the best wood on those trees. It is claimed that the value of an acre of land can be greatly increased by planting it with trees propagated from stock selected in this manner. The 'King of Tompkins' County' is a soft-wooded tree, and constitutionally defective, but the writer says he has a perfectly healthy twenty-year-old orchard of it which he obtained by purchasing scions of the finest tree of this variety which could be found in a district most favourable to its growth, and top-working it on the hard-wooded 'Northern Spy.'—*A. P.*

Apple, Pollination of the. By C. I. Lewis and C. C. Vincent. (*U.S.A. Exp. Stn. Oregon, Bull.* 104, February 1909).—The whole question of pollination in apples is considered, and lists of "self-sterile" and "self-fertile" varieties are given. The "self-fertile" varieties, however, contain no fertile seed. It is stated that pollens of different varieties are of different degrees of fertilizing power, but the tables given are not very convincing. Among "self-fertile" varieties the following, grown in the British Isles, occur: 'Keswick Codlin,' 'Duchess of Oldenburg'; among "self-sterile," 'Reinette de Canada,' 'Dutch Mignonne,' 'Gravenstein,' 'Hanwell Souring,' 'King of Tompkins' County,' 'Twenty Ounce,' and 'Wealthy.' Tables showing the time and duration of flowering and remarks on the technique of cross-pollination are included.—*F. J. C.*

Apple Spot Fungus, Methods of Combating. By F. Fischer (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 7, p. 432).—The author refers to spraying with Bordeaux mixture against the fungus *Fusicladium dendriticum* and points out that a good deal of it is money thrown away, because the treatment is not employed by everybody, and winter spraying is not sufficiently often carried out. After studying the disease for some years the author has come to the following conclusions: (1) That we do not yet possess *permanently* immune varieties of apples. Some sorts which in many seasons are free from the disease are attacked in others. (2) *Fusicladium* cannot attack a perfectly undamaged fruit. In the opinion of the author the fungus cannot enter the flesh of the fruit unless the epidermis is wounded. (3) The attack is dependent on weather conditions. Alternation of cool nights with warm days causes severe damage to the epidermis. The growth of the fruit flesh is at a standstill during the period of formation of

the ovules or perhaps the seeds themselves. At this period there i little danger of damage to the epidermis, and if the alternation abov mentioned occurs then the fruit does not become affected. If, how ever, it occurs during the growth of the fruit, infection is pretty sur to follow. Copious excretion of wax may in some varieties be a pro tection, and the presence of foliage is also a protection against sudde variations in temperature. Wall trees are better protected than thos in the open. On the other hand, freely suspended fruits in an open crown are quickly dried and do not give such a good opportunity fo the germination of the spores. (4) Spraying when in leaf is only o partial benefit; better results follow spraying when the trees are leafless Comparative trials of sprayed and unsprayed trees of the same sor must be extended over several seasons, as in some years even the unsprayed trees are free from *Fusicladium*. The author desires to emphasize the necessity of spraying when the leaves are absent and so reducing the necessity of so much costly and comparatively useless spraying when in foliage.—*G. H. P.*

Apple, The Future of the. By J. Craig (*U.S.A. Hort. Soc. Illinois, Trans.* 1909, new ser. vol. xlii. pp. 165-173).—The writer thinks that one of the problems of the future is the adaptation of varieties to soil and site with a view to obtaining the maximum production of fruit of the finest quality from a given area, a subject in which much research remains to be undertaken. He instances the 'Greening' as liking the heaviest type of clay loam, the 'Ben Davis' as succeeding best on a light soil, while the 'Spy' must have a soil of medium texture if the finest fruit of that variety is to be produced.—*A. P.*

Apples: Changes during Storage. By F. W. Morse (*U.S.A. Hort. Soc. Vermont, 7th Ann. Rept.*; 1909; pp. 58-60).—It has been found that though apples steadily lose in weight the proportion of water to dry matter does not change in sound, firm fruit, when several per cent. of the original weight has been lost, the explanation being that the solid matter of the fruit is destroyed by a breathing process, by which such cell-contents as sugar are converted into CO_2 and water. The measurement of the CO_2 given off affords an accurate method for calculating the rate of chemical change at different temperatures. It has been found that even at 32° F. chemical action still goes on, the rate of production of CO_2 being doubled when the temperature is raised to 50° and quadrupled at 70°.—*A. P.*

Apples, Crab. By W. Dallimore (*Garden*, May 28, 1910, p. 267).—These trees are among the showiest in the garden, several of them bearing brighter coloured flowers than do garden apples. *Pyrus floribunda* has flowers $\frac{3}{4}$ inch across, with a white ground flushed pink, and those of the var. *atrosanguinea* are deep pink or reddish. *P. Halleana* has looser growth and larger flowers. *P. baccata*, the Siberian Crab, is always effective, the flowers are freely produced, but have not the bright colouring of some kinds; it has ornamental

fruits, which often hang on the trees all winter. The Red Astrachan apple of gardens has developed from *P. astracanica*. *P. coccinea* has red fruits; in this group are ornamental fruited forms such as 'John Downie' and 'Hyslop Crab,' as beautiful in autumn as in spring. *P. Niedzwetzkiana* is distinguished by flowers of a peculiar red tinge which permeates roots, branches, leaves, and fruits. Japan gives us an ornamental species *P. Ringo*, with light-coloured flowers flushed rose. *P.* × *Scheideckeri* is very fine blooming; the flowers large and semi-double. *P. sikkimensis* is curious for the bark and branches, which are thickly set with short, almost spiny, growths. *P. spectabilis* is of large growth, resembling an ordinary apple; a variety, 'Kaido,' is recognized by its rich coloured flowers, and *Riversi* by its red ones, *flore albo* being white.—*H. R. D.*

Apples for Cold Storage. By W. H. Grant (*Agr. Gaz. N.S.W.* vol. xxi. pt. vii. pp. 567-569; 1 fig.).—The apples best adapted for cold storage are 'Stone Pippin,' 'Rome Beauty,' 'Rokewood,' 'Yates,' 'Statesman,' 'Dougherty,' and 'Granny Smith.' The apples should be wrapped in waxed tissue paper and kept in a cool chamber at about 32° F.—*S. E. W.*

Apples, Packing for Export. By J. C. R. Bryant (*Agr. Gaz. N.S.W.*, January 1910, pp. 50-57; 4 figs.).—The fruit is graded, wrapped in paper, placed in dry cases, and covered with wood-wool.

S. E. W.

Apples: Relative Order of Flowering. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S. (*Woburn, Twelfth Report*, 1910, pp. 35-51).—Observations with a view to getting some definite information on this point were made from 1905 to 1909 inclusive on a plantation consisting of 117 varieties, eight bush trees of each sort, all eight or nine years old at the start, half of each variety on the crab stock and half on the Paradise. The authors give us the average dates of flowering of all these varieties during this period, with their average, when arranged in three classes—dessert, cooking, and those classed as both (pp. 35-41). As a general statement it is true that early varieties flower early, and late varieties flower late, while there is a slight balance of earliness of flowering in favour of those on the Paradise (p. 40). Investigations to test the constancy of relative earliness or lateness show a degree of variation which would make it hopeless to attempt to arrange a number of varieties in a series according to their order of flowering with any degree of precision (p. 47), the popular idea that some are habitually early and others similarly late being due to the marked habits of certain varieties. The conclusion is arrived at that of the differences in the order of flowering of a collection of apples, ten-thirteenths is due to peculiarities of the season and three-thirteenths to differences in the varieties (p. 47). On the average, in any list of the order of blossoming of a large number of sorts the same variety may be expected to occupy a place $2\frac{1}{2}$ days different in one season from that which it occupies in another.

The earliest and latest flowering apples in the collection of 117 varieties were found to be as follows, the numbers meaning that, on the five years' average, they commenced to flower so many days later than the variety which was the earliest of all to flower in each year:—

Earliest-flowering.		*Latest-flowering.*	
'Irish Peach'	1·2	'Sandringham'	13·6
'Red Astrachan'	1·6	'Royal Jubilee'	13·4
'Duchess of Oldenburg'	2·0	'Court Pendû Plat'	13·0
'Golden Spire'	2·6	'Armorel'	12·0
'Yellow Ingestre'	2·6	'Lewis' Incomparable'	11·8
'Early Peach'	2·8	'Flanders Pippin'	11·2
'Maltster'	3·0	'Vicar of Beighton'	11·2
'Warner's King'	3·2	'Dumelow's Seedling'	11·0
'Tower of Glamis'	3·2	'Lady Henniker'	10·8
'Devonshire Quarrenden'	3·2	'Golden Noble'	10·6
'Brownlee's Russet'	3·2	'Gascoyne's Seedling'	10·5
		'Newton Wonder'	10·4

Records were also kept of the dates of flowering of a number of Scotch, Irish, French, and Russian varieties, but they showed no peculiarities in this respect.—*A. P.*

Apples, The Grading and Marketing of. By J. L. Hills (*U.S.A. Hort. Soc. Vermont, 7th Ann. Rept.* 1909, pp. 72-74; plates).—In the Hood River Valley, Oregon, the methods of the co-operative creamery have been applied to the marketing of apples, the fruit, immediately it is picked, being taken charge of by the agents of a union by whom it is graded and packed, the boxes being stamped with the name of the union and the registered number of both grower and packer. The system is said to have resulted in such absolute uniformity of grading and packing that a car-load of apples is often sold on the guarantee of the trade markings without a single box being opened. This subject is further dealt with in a Paper on "Western Methods of Packing Apples and Pears" in the Transactions of the Illinois Horticultural Society, 1909, pages 148-155, as well as in another Paper on "Fruit Growers' Marketing Associations" in the same volume, pp. 269-282. It is claimed that the products of the Western States mark the acme of perfection in the matter of packing and transporting fruits.—*A. P.*

Aquilegia alpina (*Bot. Mag.* tab. 8303).—Nat. ord. *Ranunculaceae*; tribe *Helleboreae*. Alps and Apennines. A perennial herb with several stems; 1-3 flowered; leaves biternate; flowers 3 inches across, blue-violet.—*G. H.*

Aristolochia moupinensis (*Bot. Mag.* tab. 8325).—Nat. ord. *Aristolochiaceae*. Western China. Undershrub, scandent; leaves cordate, 4½ inches long, 4 inches wide; perianth tube, pale green; limb, obliquely 3-lobed, 1¼ inch across; the margin, recurved, yellowish, with red markings within.—*G. H.*

Arizona, A Protected Stock Range in. By D. Griffiths (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 177, Apr. 1910).—An area on the stock ranges, which had been very closely grazed, was enclosed by a fence some years ago. The grazing greatly improved, so that at the end of about three years it was as good as it was originally. Perennial plants are gradually supplanting annual ones, but one or two weeds are more than holding their own, especially *Isocoma coronopifolia* and *Lupinus arizonicus*, the latter being particularly troublesome, for horses are greatly injured by it. Of introduced plants, only *Erodium cicutarium* (alfilerilla) holds its own along with a few native plants that have been sown. The shrub *Prosopis glandulosa*, and others, are increasing rapidly over both the enclosed and grazed areas, and proving great impediments to mowing. The author considers the increase of shrubby vegetation to be chiefly due to checking fires.

F. J. C.

Aroids, History and Utility of Cultivated. I. Yantias, Taros, and Dasheens. By O. N. Barrett. **II. Agricultural History and Utility of.** By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 164, Feb. 1910; 10 plates).—Part I. contains information regarding the different species and varieties of *Xanthosoma*, *Colocasia*, and *Alocasia* likely to prove of use as cultivated crops in Southern States with aids to distinguishing the different species. They are used for salad plants and the production of starch and alcohol.

Part II. deals with the ancient history and questions of introduction to America of these Aroids.—*E. A. B.*

Arrowhead, The Double-flowered (*Garden*, Feb. 5, 1910, p. 67; fig.).—This is to be planted in the mud in water 6 inches to 1 foot deep. By planting six or more roots together an imposing effect is obtained.—*H. R. D.*

Azalea Disease: Its Spread to Schleswig-Holstein. By Dr. Ewert (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 6, p. 321).—Records the appearance of the fungus *Septoria Azaleae* occurring for the first time in this part of Germany. The fungus was first described in Italy by Voglino, and the affected leaves, which become brown, were in this case examined by him and pronounced to be attacked by this fungus. Pycnidia were absent, and even in Italy are seldom found. In a second season one of the two previously attacked plants was observed to be suffering apparently from a recurrence of the same disease. It was found, however, that no fungus was present, and that the plant was only suffering from want of water, the symptoms of which were very similar to those produced in the previous year by *Septoria Azaleae*.—*G. H. P.*

Bacteria, Classification of. By H. A. Harding (*U.S.A. Exp. Stn. New York, Tech. Bull.* 13, June 1910).—The author has tested the cultural characteristics of forty-four strains of the bacterium

Pseudomonas campestris, with the object of ascertaining the value of certain physiological characters as bases for classification. He finds that in ten physiological reactions the same result was obtained from each of the strains. He therefore concludes that these reactions offer a satisfactory basis for classification.—*F. J. C.*

Banksia marcescens. By F. Ledien (*Gartenflora*, vol. lix. pt. xxii. pp. 473, 474; 1 col. plate).—*Banksia marcescens* is recommended for the conservatory. It resembles *B. marginata*, but is more beautiful.—*S. E. W.*

Bee Diseases, The Relation of the Etiology (Cause) of, to the Treatment. By G. F. White, Ph.D. (*U.S.A. Dep. Agr. Bur. Entom., Bull.* 75, pt. iv., December 26, 1908).—Disease is one of the greatest obstacles the bee-keeper has to contend with. Of the several diseases to which bees are liable, those which cause the greatest loss attack the brood or larvæ, and are known as American foul brood, European foul brood, and pickled brood. Considerable loss is also incurred from paralysis and dysentery. To treat these diseases effectively it is important that bee-keepers should be familiar with their etiology or cause. The predisposing causes are: age, sex, heredity, race, climate, and pre-existing disease. Exciting causes are food and micro-organisms.

The spores of the bacteria causing American foul brood are very resistant to heat and disinfectants; they resist the action of boiling water for fifteen minutes, and live for two months in a 5 per cent. solution of carbolic acid and a 1:1000 aqueous solution of mercuric chloride.

The cause of European foul brood, which attacks the larvæ at an earlier period, is not definitely known.

Both these diseases are contagious, and the author believes prevention better than cure, and makes good suggestions for preventive and curative treatment.—*V. G. J.*

Begonia Martiana var. **grandiflora** (*Bot. Mag.* tab. 8322).—Nat. ord. *Begoniaceae*. Mexico. Herb, 1½ foot high; leaves 3-6 inches long, 2-3 inches wide; flowers large, rose-pink.—*G. H.*

Bordeaux Mixture with Sugar, "Cucasa." By A. Kölliker (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 7, p. 386).—The author refers to an article by the late Professor Kelhofer, who recommended the addition of small quantities of sugar to Bordeaux mixture at the time of preparing it. This addition, he maintained, acted as a kind of "preservative" to the mixture, preventing it from losing its efficacy on standing, even for a long time. Kölliker points out that an addition of this kind has been used by Rumm, and a patent preparation embodying it and called "Cucasa" has been put on the market. The sugar probably at first forms a calcium saccharate, with which some of the copper combines and forms a product soluble in water. The double

salts of copper, lime and sugar are very unstable, and when sprayed on the foliage probably decompose quickly and liberate copper salts in solution, which kill the germinating spores.—*G. H. P.*

Botanic Garden for South Africa. By Mr. N. S. Pillans (*Agr. Jour. Cape G. H.*, June 1910, pp. 638-641).—The establishment of a Botanic Garden in the sub-continent is advocated; the author laments the ignorance of the floral resources of the country. The article closes thus: "The garden, once established, would immediately commence to add to the little stock of knowledge now in hand, and by accumulating scientific data, investigating and assisting farmers and others in the utilization of economic native plants, and recording practical experience in general horticulture, as well as popularizing and encouraging the cultivation of the most beautiful of the indigenous plants, it would serve every reasonable demand that could be made of any botanic garden."—*A. A. K.*

Botanic Gardens, French. By F. Kanngiesser (*Oestr. Gart. Zeit.* vol. v. pt. x. pp. 384-391).—The Jardin des Plantes at Nancy contains a weeping *Fagus silvatica* var. *tortuosa*, grown from a seed of the same variety. A medlar shoot grafted on a *Crataegus oxyacantha* bears leaves resembling those of the *Crataegus*; for four years it bore white flowers, but this year the flowers are pink.

The Jardin des Plantes at Dijon contains three interesting trees, namely, a *Salix babylonica*, grown from a cutting taken from Napoleon's grave in St. Helena, a chestnut grafted on to an oak in 1835 (exceeds the oak in circumference), and a large black poplar, 27 feet in circumference, 4 feet from the ground.

In the Jardin des Plantes at Lyon, the palm-house is the great attraction. It contains fine specimens of *Corypha australis*, *Caryota Rumphiana*, and *Phoenix canariensis*. In the *Victoria Regia* house there is a handsome *Nymphea stellata* var. *bulbifera*.

The highly interesting Jardin des Plantes at Montpellier was founded in 1596. It contains some very fine trees, *e.g. Fraxinus ornus*, *Zelkova crenata*, *Cupressus sempervirens*, and *Gingko biloba*. The great sight of the gardens are the ponds containing *Pontederia azurea* and *P. crassipes* and *Nelumbo speciosa*. These plants can remain in the open all the year round in Montpellier.

The Jardin des Plantes in Toulouse contains many interesting trees, such as *Gymnocladus canadensis*, *Ehretia serrata* var. *obovata*, *Sterculia platanoides*, and *Eucalyptus urnigera*. The latter can resist a temperature of 10° F. The groups of *Acer Negundo* fol. var. interspersed with *Prunus Pissardi* are very striking.

The Botanical Garden in Bordeaux has some fine groups of *Chamaerops excelsa*, which produce innumerable seedlings. *Pritchardia filifera*, *Laurus Camphora*, *Olea europea*, and *Musa japonica* require no protection in winter. *Poinciana Gilliesii*, from South America, and *Pueraria Thunbergiana* are worthy of notice.—*S. E. W.*

Botanic Gardens, Tropical. By J. C. Willis (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 226-234).—The history of the foundation and development of tropical botanical gardens is traced in this paper. In Europe botanical gardens were first founded as an aid to the science of curative medicine and begin with the garden at Padua in 1545.

The earliest tropical botanical garden seems to have been the one in Ceylon founded in 1760 for the introduction and acclimatization of plants from other countries into Ceylon. The famous garden of Buitenzorg, in Java, was established in 1817. At the time when Dr. Treub took over the direction of this garden, in 1880, almost all the useful plants which could be introduced had already found a home in the garden, and most of the native plants were represented in it. Dr. Treub, however, struck out in a fresh direction and opened out a new sphere of usefulness for the garden. The work of the older botanic gardens was based simply on systematic botany; but now, largely under the influence of Dr. Treub, the garden at Buitenzorg began to reflect the development of the whole field of botany, including more especially the study of the fungi, of vegetable physiology, of plant breeding and evolution, and of many other lines of work. Further developments of the Buitenzorg and other tropical botanic gardens are touched upon in the article.—*R. B.*

Brassocattlaelia × Fürstenbergii. By T. Franke (*Orchis*, vol. iv. pt. iv. pp. 57-58; 1 plate).—This hybrid is a cross between *Cattleya Trianiae* and *Brassolaelia Gratrixiae*. It bears beautiful orange-coloured flowers.—*S. E. W.*

Brown Rot. By T. Johnston (*Agr. Gaz. N.S.W.* March 1910, pp. 194-195; 1 plate).—Apples, tomatos, peaches have been attacked by *Gloeosporium fructigenum* in New South Wales. A much more common fungus is *Monilia fructigena*, which attacks plums, nectarines, apricots, cherries, and pears, in addition to the fruit previously named. In both cases brown rot is the result. All diseased fruit and twigs must be destroyed. The trees should be sprayed with Bordeaux mixture in early spring, and again just after the fruit has set.

S. E. W.

Brown-tail and Gipsy Moths, Caterpillars of the. By S. A. Forbes (*U.S.A. Hort. Soc. Illinois, Trans.* 1909, new ser. vol. xliii. pp. 96-102; 2 plates).—These two pests are well known in Europe, the latter being stated to have caused a great deal of damage to the German forests in 1908. Both are prevalent in the New England States, and the importation of infested nursery stock from abroad is assisting their spread westwards. The Department of Agriculture, U.S.A., is doing good work in introducing from Europe the native parasites of these insects, a work which is making such successful progress that neither of the pests seems likely to become seriously destructive. The brown-tail seems to be less easily controlled by parasites than the gipsy

moth, but a fungus disease of the former has been unwittingly imported which has been cultivated and distributed artificially, and seems likely to work more destruction upon the moth than the parasites.—*A. P.*

Budding Fruit Trees. By F. Rochau (*Gartenflora*, vol. lix. pt. x. pp. 229-230).—When a tree has been grafted with an inferior variety, recommends budding on spots from which the old buds have been removed. When the buds begin to grow the upper half of the branch is cut off.—*S. E. W.*

Bud Rot of Coconut Palm (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 36).—It is not yet known what causes this disease; very different reports are given by different investigators. It may be due to bacteria. Considerable damage has been done in many coconut plantations.

D. M. C.

Bulbophyllum virescens (*Bot. Mag.* tab. 8327).—Nat. ord. *Orchidaceae;* tribe *Epidendreae.* Java. Herb epiphyte; leaves ovate-oblong, 6-8 inches long; flowers large and showy, in 8-10 flowered umbels; sepals spreading, cordate-acuminate, tapering, 4-5 inches in length, pale green, with brownish veins and nerves; petals 1½ inch long, ¾ inch broad at base, pale green; lip ¾ inch long, with a purple base.—*G. H.*

(Bunt) Stinking Smut and Fungicides. By G. L. Sutton and R. G. Downing (*Agr. Gaz. N.S.W.* vol. xxi. pt. v. 382-397).—At Cowra Experimental Farm the best preventive of bunt in 1909 proved to be pickling the grain before sowing in a solution of copper sulphate and salt. The solution is prepared by allowing common salt to remain in a 2 per cent. solution of copper sulphate for two hours at a temperature of 140° F. The clear liquid is poured off the undissolved salt, and the grain is immersed in the solution for five minutes. Fergusine, a proprietary article, also proved to be efficacious. Bordeaux mixture, salt water, and formalin did not yield good results.—*S. E. W.*

Bunt and Fungicides. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxi. pt. ix. pp. 751-756; 3 figs. 1 plate).—*Tilletia tritici* or *caries* and *T. levis* or *foetans*, commonly known as bunt, are developed from spores in four stages—viz. the spore sends out a delicate germ tube or promycelium, from which eight branches (conidia) are produced. The conidia are united in pairs by a short cross-tube; then the pairs produce a sac, from which thread-like hypha arise, which penetrate the wheat grain and absorb the starch, and again produce the primary spores. Treatment with formalin or with copper sulphate, followed by lime, does not impair the germination of the seed; but treatment with a 2 per cent. solution of copper sulphate alone does kill or impair the vitality of the wheat.—*S. E. W.*

"Caltrop" (*Tribulus terrestris*). By H. C. L. Anderson (*Agr. Gaz. N.S.W.* vol. xxi. pt. v. pp. 442-443; 5 figs.).—This dangerous weed creeps on the ground, and bears yellow flowers with five petals. The fruit is hard and is provided with five spines, which can lame horses and other animals.—*S. E. W.*

Canker "New York": Occurrence in England. By E. S. Salmon (*Gard. Chron.*, No. 3617, April 1910; fig.).—This canker, due to *Sphaeropsis malorum*, has been found in the branches of a pear-tree growing in Surrey. The disease can be distinguished from the injury caused by the scab fungus (*Venturia pirina*) in two- or three-year-old wood of some varieties of pear, by the marked cracking of the bark, the formation of incipient "cankers," and by the absence of the pock-like markings so characteristic of pear scab. This injury is not so deeply seated as the true canker due to *Nectria ditissima*.

Treatment with Bordeaux mixture is recommended.—*A. S. H.*

"Canker" of Apple Trees Caused by the "Brown Rot" Fungus. By E. S. Salmon (*Gard. Chron.*, No. 3621, May 1910; fig.).—The fungus *Sclerotinia fructigena*, in its conidial or *Monilia* stage, has long been known as the cause of the "Brown Rot" disease of certain fruit-trees, while the mycelium can invade and kill the wood of the cherry, plum, and peach. The author states that this fungus, under certain circumstances, causes a canker in apple-trees, which is always situated in the neighbourhood of a fruit spur. Infection of the branch is brought about in the following manner: Apples attacked by the "Brown Rot" fungus may remain in the tree during winter, and in some cases, when rotting, press against the part of the branch near the spur on which they were borne; thereupon the mycelium penetrates from the diseased apple into the branch, causing local injuries of a more or less cankerous nature. Again, a canker may arise by the mycelium invading the wood from a fruit spur which has become diseased through its flower or fruit being attacked.

The disease is liable to occur only on certain varieties of apple.

Spraying with Bordeaux mixture is recommended *just before* the flower-buds open, and again directly the bloom has set.—*A. S. H.*

Cattleya 'Princesse Elitna.' By G. T. Grignan (*Rev. Hort.*, May 16, 1910, pp. 228-229; col. plate).—The plate represents a very beautiful form derived from *C. Mossiae Reineckeana* × *C. aurea*. Petals and sepals pure white, labellum wide, with crenate, crispate edges, rich yellow mouth with magenta stripes blending towards the edge into a magenta margin with lighter edging.—*C. T. D.*

Cereus tricostatus R. R.-G. By Roland-Gosselin (*Rev. Hort.*, Jan. 16, 1910, pp. 28-29; 1 illus.).—Highly recommended as a handsome climbing Cereus suitable for growing in soil in a cold greenhouse. Flowers successively from April to November if the roots be guarded from frost; flowers very large; fruit deep crimson, weighing over a pound.—*C. T. D.*

Cherries, Bush More Convenient than Standards. By L. Chasset (*Pom. Franç.* June 1910, pp. 162-165).—These are recommended for commercial plantations as being much more convenient for all purposes.—*C. H. H.*

Cherries, Studies on the Gummosis of. By Grüss and Sorauer (*Not. König. Bot. Berlin*, No. 47, vol. v. Nov. 1910, pp. 188-197).—Previous writers have usually considered gummosis of cherries, plums, &c. (*i.e.* a disease in which abnormal quantities of gum are produced by the plant) to be due to the influence of wounds upon the tree.

Grüss and Sorauer find, however, that the phenomenon may take place in the absence of any wounds, and they consider that it is due to the derangement of a normal physiological process. This disturbance *may* be induced by wounding the plant, but it may also originate from a number of other causes. The gum is produced by the transformation of hemicelluloses contained in the membranes of certain cells, and also of reserve materials lying in the protoplasm itself. Under normal conditions these substances are acted upon by two sets of enzymes—hydrolyzing and coagulating ferments respectively—but under certain abnormal conditions the balance between the two sets of enzymes is upset, and the hydrolyzing ferments get the upper hand. In consequence of this abnormal quantities of gum make their appearance in the tissues of the plant.—*R. B.*

Chestnut. By F. de Castella (*Jour. Agr. Vict.* October 1910, pp. 656-664).—Soil with but little lime is best for the chestnut. With over 4 per cent. carbonate of lime the chestnut will not thrive; it is grafted with good varieties, and grows to a height of 50 feet. Over a ton of chestnuts may be obtained from an acre of trees (in this case receiving some slight cultivation), worth about £5 after deducting about 35*s.* for cost of gathering. This is a higher yield than the ordinary run of plantations of poorer sorts, the average yield of which would amount to about one-third of the above estimate. The chestnut is valuable as a food-tree as well as for timber and shelter.—*C. H. H.*

Chlorosis or Jaundice. By G. Rivière and G. Bailhache (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 137; Feb. 1910).—This disease is said to be the result of attempting to grow pear trees, especially those grafted on quince, in a soil containing too large a proportion of chalk. Analyses and tables are given which point to the fact that pears, grafted as above, are not to be successfully grown in soils containing more than 40 grammes of chalk per kilogramme.—*M. L. H.*

Chrysanthemums: Certificate of Merit (*Rev. Hort.*, Feb. 16, 1910, p. 75).—The Société Nationale d'Horticulture issues two degrees of award, the superior of which can only be given on the third year of exhibition—an idea worthy of consideration here in connexion with these and other flowers.—*C. T. D.*

Chrysanthemums, Classification of (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 128; Feb. 1910).—The already classified lists of chrysanthemums have just been revised in France by a strong committee. The best varieties for each group have been carefully selected and each variety is described by colour as well as by name for the guidance of amateurs. The grouping is according to the ease of growth, time of flowering, methods of growth, colour, etc.

Chrysanthemums Grown in Baskets. By Gaston Clement (*Rev. Hort.*, Jan. 1, 1910, p. 8-9; 1 illus.).—The illustration shows a very charming effect produced by growing a single plant in a handled basket, over and around which the branches were trained, entirely covering the basket and handle with flowers and foliage.—*C. T. D.*

Chrysanthemums, New. By Max Garnier (*Rev. Hort.*, Jan. 1, 1910, pp. 21 and 22). By Gaston Clement (Jan. 16, 1910, pp. 35-36; 1 illus.; and Feb. 1, 1910, pp. 61-63).—Two descriptive lists of new French introductions or eligible varieties.—*C. T. D.*

Chrysanthemums, New and Old. By K. F. Münster (*Oester. Gart. Zeit.* vol. v. pt. i. pp. 19-20).—Gives lists of varieties deemed worthy of cultivation.—*S. E. W.*

Chrysanthemums, Rot in (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 52; Jan. 1910).—The means generally employed to produce the enormous blooms required of show chrysanthemums also tends to cause rot, which appears in two parts of the flower—the heart or receptacle, and the petals. These represent two different forms of rot, which must be differently treated; but both are produced by an excess of manure, and especially of nitrogenous manure.

This article gives the results of experiments which tended to show that the chrysanthemum has not that predilection for nitrogenous manure with which it is generally credited, and that, on the other hand, it requires much more lime and potash than it generally receives. The amount of phosphoric acid generally given to the plant is also probably excessive, though, as a matter of fact, it will only assimilate as much of this as it really requires. In order to produce the largest possible blooms without danger of rot the compost used must be rich in lime and potash, and should be prepared a year or two before it is wanted. If at the flowering season additional nourishment is to be given in order to increase the length of the petals, the plant should already be firm and rigid, and should have at its disposal enough potash for the formation of the receptacle and of lime to ensure firmness of tissue to the petals. Waterings with nitrate of ammonia should only be given out of doors, and only when the bud is quite formed and the petals ready to expand. In soils which are poor in lime it is advised to add 10 to 12 kilogrammes of lime to a cubic metre of the compost, and in order to help the nitrification of the mass about one kilogramme of flowers of sulphur to a cubic metre should also be added.

the compost being prepared at least a year before it is to be used, and turned over not less often than once a month.—*M. L. H.*

Cirrhopetalum biflorum (*Bot. Mag.* tab. 8321).—Nat. ord. *Orchidaceae;* tribe *Epidendreae.* Java. Epiphyte; leaves 5-6 inches long; scapes slender, 3-4 inches long, two-flowered; flowers large, purple-dotted; sepals, upper, lanceolate with a long seta; lateral, linear lanceolate, much attenuated, 3½ inches long, decurved.—G. H.

Clianthus Dampieri, Grafting of. By Von W. Vorwerk (*Gartenflora,* vol. lix. pt. xxi. pp. 469, 470).—It is advisable to graft *Clianthus Dampieri* seedlings on seedlings of *Colutea arborescens.* In February the *Colutea* is sown in sandy soil, and the young plants pricked out in pots of light soil and grown on with bottom heat. Then the *Clianthus* is sown. The seedling is cut off close to the ground and the wedge-shaped piece inserted in a slit cut between the cotyledons of the seedling *Colutea.* The graft is held in place by wrapping with yarn. The plants are placed in a closed frame at 60° F. and protected from sun and wet for ten days. They are then given air and sun, and may be planted out in the open or placed in a cool house by the end of May.—*S. E. W.*

Climate: So-called Changes in the Semi-arid West. By R. N. Sullivan (*U.S.A. Dep. Agr. Year Book,* 1908; pp. 6).—An interesting account of the supposed alteration of climate by the decrease of forest lands and increase of cultivation. This idea has long been held, by Gibbon among others, but reference to records dating from 1870 show no evidence for its support in Western America.—*E. A. Bd.*

Coccideæ, Catalogue of Recently Described. II. By J. G. Sanders, M.A. (*U.S.A. Dep. Agr., Bur. Entom., Tech.* ser. 16, pt. iii., Dec. 22, 1909).—In this catalogue, the second of the series, are included references to 24 new genera, 195 new species, and 14 new varieties of Coccideæ or scale insects, with their habitations and the names of the plants on which they have been found.—*V. G. J.*

Coelogyne (*Oestr. Gart. Zeit.* vol. v. pt. x. pp. 381-384).—The genus *Coelogyne* is divided into two sub-genera, *Succedaneae* and *Simultaneae,* which are further divided into the series (*a*) *Nudae,* (*b*) *Vaginatae,* (*c*) *Nudiscapae,* (*d*) *Glumacae,* (*e*) *Imbricatae.*—*S. E. W.*

Coffea: Materials for a Botanico-Agricultural Study of the Genus. By E. de Wildeman (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 345-384).—This paper contains a very detailed enumeration of the species, varieties, forms and hybrids belonging to the genus *Coffea.* The work is prefaced by an interesting discussion of the difficulties which stand in the way of obtaining a really satisfactory classification of the coffees, and previous attempts in this direction are reviewed at some length.—*R. B.*

Coffee Bean Weevil, New Breeding Records of the. By E. S. Tucker (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. vii. August 5, 1909; 1 plate, 1 fig.).—The author, while making field observations on the cotton boll-weevil in 1908, had his attention directed to strange weevils occurring in dried cornstalks.

Larvæ, pupæ, and a few adult insects were found which were identified as the coffee bean weevil, *Araecerus fasciculatus* De Geer. This species must therefore be recorded as a new enemy of cornfields, selecting, as it does, cornstalks for breeding purposes.

Previous published records of this insect show it to be common in warm climates, and that it has no particular food preferences. It is as likely to be found breeding in beans or any stored dry vegetable products, including dried fruits, as in dry pithy stalks, and is commonly found breeding as a scavenger in dry decayed cotton bolls.

V. G. J.

Copaifera Species, A New, from Spanish Guinea, and on the Mother-plant of Cameroon-copal. By H. Harms (*Not. König. Bot. Berlin*, No. 47, vol. v. Nov. 1910, pp, 175-183; 1 text-figure).—Dr. P. Preuss (in 1898) collected branches of a Copal tree which, he stated, was common in the forests along the river Sannaga. This tree is said to yield "rubber-stone." A nearer determination of the tree was, however, impossible, as only leaves were borne on the branches. In 1909 Professor Buesgen brought back leaves and fruits of the tree, and from this material Harms was able to conclude that very probably the Copal tree, which was abundant in the Cameroon district, belonged to the same species as the plant previously described by him from Lake Leopold II. under the name *Copaifera Demensei* Harms. Quite recently this conclusion was confirmed by the collection of flowering material by Mr. Eric Conrad at Fishtown, in the Cameroon district. Harms is therefore able to describe and figure the plant in detail in the present paper.

A new species of Copal tree was collected by Mr. G. Tessmann in Spanish Guinea, and is here fully described by Harms.—*R. B.*

Copper Injury to Fruit Trees (*Pom. Franç.* March 1910).—Use copper sulphate no stronger than 3 kilos to 100 litres of water, and 1 kilo of molasses to make it adhere; the addition of lime neutralizes the action of the copper, and is therefore omitted.—*C. H. H.*

Corn-planting, A More Profitable Method of. By C. P. Hartley (*U.S.A. Dep. Agr., Farmers' Bull.* 480, May 1910; figs.).—A method is described by which all the many disadvantages of planting Indian corn too thickly may be avoided and the rows set so as to permit every plant to get its due share of space and light, without any added expense at seeding time and with a great additional yield at harvest.

M. L. H.

Cornus Bretschneideri (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 123; Feb. 1910).—A species of *Cornus* raised from seed sent by

Dr. Bretschneider, Doctor to the Russian Legation at Pekin, to the Natural History Museum in Paris. Its value consists in the colour of its stems—pale yellowish-green, or even sometimes lemon yellow with reddish tips, which in winter produce a striking effect, seen against a background of dark evergreens.—*M. L. H.*

Cornus florida var. rubra (*Bot. Mag.* tab. 8315).—Nat. ord. *Cornaceae.* Eastern N. America. Tree, 40 feet high; leaves broadly elliptical, 5 inches long; bracts 4, petalloid, bright rose; fruit red.—*G. H.*

Cornus macrophylla, On the Influence of Meteorological Conditions upon the Root-pressure of. By M. Miyoshi (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 97-104; with two figs. and two tables).—The root-pressure of a tree standing in the open varies according to the changes in the meteorological conditions. Among the principal effective agencies must be counted atmospheric condensations, rain and snow, on the one hand and wind upon the other. The former of these makes the pressure-curve a very uniform one, whilst the pressure-curve is very variable under the influence of wind.—*R. B.*

Cornus Nuttallii (*Bot. Mag.* tab. 8311).—Nat. ord. *Cornaceae.* W. N. America. Shrub or tree, 50-85 feet in height; leaves 2-4½ inches long; bracts of involucre 6, 3¼ inches long, yellow, fruit crimson.

G. H.

Cotton, Mutative Reversions in. By O. F. Cook (*U.S.A. Dep. Agr., Circ.* 53; 18 pp.).—A discussion of the "reversions" of cottons. This does not necessarily arrive after hybridization, but often in pure-bred stocks. Its interference with Mendelian results is considered, and, in the author's own words, "Reversions transgress the Mendelian program."

This "program," however, assumes stable varieties as material, and the criticisms therefore will fall water-like from Mendelian backs.

E. A. Bd.

Cotton, Origin of the Hindi. By O. F. Cook (*U.S.A. Dep. Agr. Circ.* 42; 12 pp.).—The prevalence of the Hindi (Arabic Indian) cotton in Egyptian samples, on account of its inferior fibre, greatly detracts from the value of high grades.

The introduction of Egyptian cotton into America brings with it the problem of eradicating the Hindi, and the labour problem there prevents the hand-sorting which is done in Egypt.

A discussion of its origin is given, and it is considered by the author to show many affinities with varieties from Mexico, and to be of American origin.—*E. A. Bd.*

Cotton Soils, Fertilizers for. By Milton Whitney (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 62, Sept. 1909).—This bulletin gives in

tabulated form the results arrived at from some 2,802 tests of substances applied to cotton soils during a period of twenty-one years. These experiments were concerned with the application of thirty-five mineral and organic fertilizers and of seventy-one different combinations of two or more of these substances, and there have been many different proportions of the several ingredients in the combinations. The only argument against the absolute conclusiveness of the results is that many of the tests were made only for single years on the same soil, or at most were continued for two or three years, but they were carried out on such a large number of soils over such a number of years that they may be safely followed as a guide to the selection of fertilizers for any given cotton soil in the absence of any more specific knowledge of its individual wants.

A summary of results shows that the chances of increased crops are greater with mixed fertilizers than with a single one, and the larger increase gives generally a larger profit. The increase in yield due to mixtures of minerals applied approximates to the sum of the increase due to the individual fertilizers. The increase of crop was as great from a given quantity of fertilizer used upon a good soil as upon a less productive soil.—*M. L. H.*

Cotton Stalk-Borer, The. By A. C. Morgan (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 63; pt. vii., Feb. 9, 1907; 1 plate).—The cotton stalk-borer is not a common pest. Dr. L. O. Howard, in 1896, wrote as follows: "There is but one borer in the stalks of cotton, and that is the long-horned beetle known as *Ataxia crypta Say*. It is occasionally mistaken for an enemy of the plant, but investigation has shown that it lays its eggs upon, and its larvæ bore into, only such stalks as have been damaged by some other cause such as rust."

The author of this bulletin has found that nearly all infested plants show signs of previous injury, yet the comparatively fresh and healthy condition of a few stalks seems to point to the probability of healthy stalks being sometimes attacked.

If the injury by this insect ever becomes serious, destroying infested stalks early in the fall will reduce its numbers.—*F. G. J.*

Crocus, The Fascination of the. By E. A. Bowles (*Garden*, March 5 to April 30, 1910, pp. 123, 129, 140, 153, 166, 177, 213).—The author claims five points in favour of the crocus: (1) the flowering period extends from August to mid-April, over the dull season of gardening; (2) the extensive range of colouring from which green only is wanting; (3) fragrance, which is usually found as a delicate scent resembling the primrose, but with an odour added, such as is found in *Iris uniguicularis*. There is one malodorous species known as *C. graveolens;* (4) Crocuses are for the most part cheap; and (5) except for a few winter flowering species they are absolutely hardy.

Spring Crocuses are taken as those beginning to flower with the New Year, or during the four following months, but there is an exception in *C. Cambessedesii*, from Majorca and Minorca, which had been lost to

gardens, but has recently been reintroduced by the author. This little Crocus is one of the smallest, of a delicate lilac but pale yellow outside, feathered with purple. It flowers from October to March.

A large proportion—ten—of the spring Crocuses have yellow flowers, while in seven others the three outer segments are tinged outside with yellow. Moreover, some of the typically lilac forms, such as *aërius*, a variety of *reticulatus*, or white, as *candidus*, have produced yellow seedlings. Perhaps the golden shades may be more conspicuous among withered grass, stones or bare earth, while the lilac shades of the autumnal forms make a contrast with the browns and oranges of fallen leaves.

The spring Crocuses may be divided into two groups—(1) the florist's and (2) the wild type. Most of the florist's forms belong to *C. vernus*. From *C. vernus* there is a remarkable absence of yellow, but 'G. Maw,' a white, has an orange tip to the three outer segments. In some forms of *vernus* the tips are white or paler than the ground colour—e.g. *leucorhynchus* and *Leedsii*. Among selfs, 'Mont Blanc' (white), *purpureus grandiflorus* (purple), 'L'Unique' (a rosy shade), and 'Beauty' (a soft mauve) are spoken well of. The next most important are forms derived from *C. aureus*. The common yellow Dutch crocus has been propagated for centuries solely by offsets. The only other species made much of by the florists is *C. versicolor*, in which the inner segments are nearly as much feathered as the outer.

Among true species, and neglecting the rarer forms, may be mentioned *C. Imperati*, with two varieties, *monophyllus*, coming through the ground covered with one spathe only; and *diphyllus*, covered with two spathes. *Monophyllus* is taller, and begins to flower in January; while *diphyllus* has larger flowers and great variety of feathering, and, though sometimes flowering at Christmas, is generally later than *monophyllus*.

C. Sieberi (bluish lilac) is another crocus for every garden. *C. Tomasinianus* (shades of lilac from nearly white to amethyst) is a veritable but beautiful weed when once it begins to seed. *C. chrysanthus* is divided into three classes—(1) the type, one of the first in the New Year, with small orange-yellow plumes; (2) *pallidus*, sulphur or white, feathered bronze, purple, grey, or blue; (3) *fusco-tinctus*, with pointed segments striped or suffused brown or grey, with dark grey anthers and yellow stigma. *C. biflorus* has two forms, one the Scotch Crocus, with five dark purple lines on a white ground, is sterile; the other, the Italian form, is smaller, yellowish outside marked with three lines, and lavender within. *C. Balansae*, orange, is a good doer. *C. Korolkowi* flowers early, and is of a peculiarly brilliant yellow. *C. etruscus*, buff outside, lavender within, requires replanting oftener than most, or it becomes crowded. *C. ancyrensis* is like *chrysanthus*, but without the black spots in the anthers.

Autumnal Crocuses.—With the exception of two scarce species, *C. vallicola* and *C. Scharojani*, *C. zonatus* is the first to flower in September with flowers of a soft rosy lilac and a zone of rich orange

in the throat. It is singular in the shape of its bulb, and produces numerous small offsets. *C. speciosus*, the tallest of all, is very robust and not particular as to soil. It is more nearly blue than any other, and should be planted in August fairly deep; the finest form is known as *Aitchisonii*. *C. pulchellus*, nearly related, is paler lavender with rich orange spots and white anthers; it flowers after *speciosus*, at the end of October.

Among the earlier Autumn Crocuses is *byzantinus* (*iridiflorus*), of which the inner petals are small, pale, and pointed, the outer being wide and fall outwards, of various shades of lilac and purple. It is best in the shade under a north wall.

The Greek species are late. *C. Tournefortii*, the first to flower, is lavender with white stamens, rather tender and soon damaged by weather. *C. Boryi*, creamy white, is only for the frame. *C. marathonisius*, large white with scarlet stigma, requires a sheltered corner. Of *C. laevigatus* there are two forms; one white, with or without stripes and feathers; the other having a pale lilac ground. It is strong, and stands bad weather well.

Next comes a Spanish group: *C. nudiflorus* is rich purple, *C. asturicus* being smaller and without the underground runners produced by the first. *C. Salzmanni* is robust, but of a washy lilac. *C. Clusii* resembles *asturicus*, but has well-developed leaves when flowering. *C. serotinus*, once common, has nearly disappeared. *C. medius*, from the Riviera, is hardy, and forms a link between *nudiflorus* and *sativus*; it has deep scarlet stigmas. *C. sativus*, once largely cultivated for saffron, requires a sunny, well-drained position; it has several varieties. *C. hadriaticus*, nearly related, is white with some yellow in the throat. *C. longiflorus* is very fragrant, of a rosy shade of lilac, and flowers freely in the end of October and November; it should be given a sheltered nook on the rock garden. *C. cancellatus*, a white ground striped purple, has a variety from farther east with a lilac ground known as *cilicius*, and sold for food in Damascus. *C. caspius* is white, sometimes with a rosy tinge, and should be kept in a frame. Other beautiful species, such as *C. hyemalis* and *C. Foxii*, are too tender for the open ground.

After treating of the species Mr. Bowles describes their uses. For planting in the open ground he has found *Tomasinianus* the most satisfactory of the wild kinds, and of autumn bloomers *zonatus* and *pulchellus* to be the best for this purpose.

The Rock Garden provides a congenial home for most of the smaller species, especially in such places as at the foot of a large stone. But best of all for the choicest varieties is a strip of ground a foot wide in front of a sheltered south border with a low edging. The different sorts may be divided from one another with sunk slates, and, to further prevent mixing, corms with different tunics may be planted next to one another. The corms should be planted 4 inches deep. Directions are given for raising seedlings. The capsules appear above ground about May, and seed may be sown from thence till mid-September.—*H. R. D.*

Crown Gall of the Grape, Field Studies of. By George G. Hedgcock (*U.S.A. Dep. Agr., Bur. of Pl. Ind., Bull.* 183).—This disease which attacks both root and canes of the grape vine is due to a bacterium, *Bacillus tumaefaciens*. The same produces galls also on the tomato, tobacco, potato, sugar beet, hop, peach, cherry, &c. Some species of *Vitis* are much more resistant to the disease than *Vitis vinifera*, the chief being *V. rupestris*, *V. vulpina* (which are almost immune), some varieties of *Vitis aestivalis*, *V. Labrusca*, &c. American varieties of grape vine are not nearly so susceptible as the European, and vines which are very sensitive to frost are much more prone to the disease. The bacterium is a wound parasite, and the galls generally develop at the junction of stock on scion, injure the root, and spread up the stem and become confluent. Apples and pears when artificially inoculated with the bacterium gave negative results. The disease may be spread by irrigation (especially surface irrigation), insects, birds, the pruning knife, &c. Spraying with fungicides and the cutting away of galls from the root and canes proved absolutely useless, and the writer recommends burning the diseased vines and replanting with resistant varieties as the only remedy. A good list of disease-resistant varieties is given.—*D. M. C.*

Cycnoches maculatum. By E. B. Behnick (*Orchis*, vol. iv. pt. vii. pp. 104, 105; 1 plate).—Male and female flowers seldom appear on the same plant. The flowers are pale green splashed with pale brown spots.—*S. E. W.*

Cymbidium insigne (*Bot. Mag.* tab. 8312).—Nat. ord. *Orchidaceae;* tribe *Vandeae*. Annam. Herb; leaves linear oblong, 3½ feet long; scapes 4 feet long; racemes, many-flowered; perianth, spreading, 4 inches across, pale rose; lip with purple blotches.—*G. H.*

Cypripedium, Fertilization of. By O. N. Witt (*Orchis*, vol. iv. pt. vi. pp. 87-93; 3 plates).—The natural method of pollination of *Cypripedium* is described.—*S. E. W.*

Cyrtopodium punctatum. By O. N. Witt (*Orchis*, vol. iv. pt. iv. p. 57; 1 plate).—An illustration of this orchid in flower.
S. E. W.

Cytisus Dallimorei (*Garden*, June 11, 1910, p. 291; fig.).—The plant was obtained as a cross from *C. scoparius* with the pollen of *C. albus*. Two plants grew from this cross, the one yellow, the other the subject of this note. It has rosy purple wing petals, and almost crimson flowers half as long again as *albus*. It is interesting as being an artificial cross, for probably all the other hybrid brooms have originated as natural hybrids.—*H. R. D.*

Daffodil, An Alkaloid from the Bulb of. By Arthur James Ewins (*Jour. Chem. Soc.* vol. xcvii. Dec. 1910, pp. 2406-2409).—From time to time one finds or hears somewhat vague references to

the presence in the daffodil of something more or less injurious or even poisonous. In 1878 an investigation showed the presence of an alkaloid, with which some experiments were made on men and frogs. The present research brings the investigation to a point where something definite can be recorded. The authors isolated from the dried bulbs of *N. Pseudonarcissus* a crystalline alkaloid which they have named 'narcissine,' having the formula $C_{16}H_{17}O_4N$. Of this the flowering bulbs (dried at about 40° C.) yielded ·1 per cent. and the resting bulbs yielded ·2 per cent. This alkaloid 'narcissine' is exceedingly stable.

The crystals can be fused with caustic potash, and even when the temperature is raised to 220° C. (428° F.) the alkaloid is only slowly attacked.

The crystals are insoluble in water, ether, or chloroform, but soluble in alcohol or dilute acids.

When the alkaloid was given by the mouth to a cat, it produced nausea, vomiting, salivation, &c., but none of the effects upon cats or frogs were similar to those produced by either atropine or pilocarpine, which were believed by Gerard, an earlier investigator, to be present.

Narcissus 'Princeps' was first picked upon for this research, but as it yielded only traces of alkaloid, it was abandoned in favour of the *N. Pseudonarcissus*.

The fact that hitherto very few alkaloids have been found in monocotyledonous plants adds to the interest of the results here obtained.

W. A. T.

Daffodils, New. Illustrated and described (generally by the Rev. J. Jacob) (*Garden*, 1910).—'The Anchorite,' May 14, p. 242; 'Apricot Queen,' May 7, p. 226; 'Armorel,' August 12, p. 402; 'Challenger,' May 14, p. 242; 'Circlet,' August 13, p. 402; 'Dresden,' September 24, p. 474; 'Eros,' September 24, p. 474; 'Felicity,' August 13, p. 402; 'Fire Dome,' April 16, p. 190; 'Firetail,' September 17, p. 462; 'Messina,' September 24, p. 474; 'Princess Juliana,' February 5, pp. 64 and 67; 'Socrates,' September 24, p. 474; 'Southern Star,' August 13, p. 402; 'White Star,' May 14, p. 242.—*H. R. D.*

Daffodil Notes. By the Rev. J. Jacob (*Garden*, Feb. 19, 1910, p. 89).—Bulbs of 'Golden Spur' from the Channel Islands and Holland were potted for forcing on the same day and kept under similar conditions, and it was found that those from Holland flowered a few days later than those from the Channel Isles, but later in the season the difference between the two was not so marked.

(*Garden*, August 27, 1910, p. 425.)—On light soil it is recommended that a good dressing of kainit be forked into the ground in the autumn before planting.

(*Garden*, August 6, 1910, p. 388.)—The value of early planting for Daffodils is insisted on. About a dozen varieties were planted in August and in November, those put in at the later date being if anything the larger bulbs. The following spring the lengths of the flower stems

were measured, and the results showed a marked difference in favour of those planted earliest. *E.g.* 'Lady Margaret Boscawen' gave 2 ft. from August planted bulbs as against 1 ft. 7 in. from those planted in November. 'Cassandra,' 1 ft. 10 in. as against 1 ft. 4 in. Other illustrations of the same effect are given.

E. H. Jenkins in the *Garden*, September 10, 1910, p. 454, gives the same advice and supports it by somewhat similar illustrations.

H. R. D.

Dahlia, Origin, Culture, and Diseases of. By K. Schechner (*Oestr. Gart. Zeit.* vol. v. pt. xi. pp. 422-430).—The Dahlia, a native of Mexico, appeared in England for the first time in 1787. The Cactus Dahlia is a spontaneous variation. It was found in a miscellaneous collection of seeds, bulbs, and tubers sent by van den Berg from Mexico to Holland. It had never been observed in Mexico in the wild or cultivated state. By crossing it with other varieties a large number of new kinds have been derived.—*S. E. W.*

Dahlias, Parisian. By A. Miller (*Rev. Hort.*, April 16, 1910, pp. 180-181; col. plate).—The plate represents five very showy particoloured varieties of single Dahlias—'Paris' crimson, bordering a broad white centre to each petal; 'Tour St. Jacques,' deep magenta with white central strip on similar lines; 'La Seine,' yellow with deep orange-marked tips; 'Observatoire.' white with pale-yellow margins; and 'Opera,' yellowish centre to petals, bordered deeply with red. Bordering well defined and handsome in 1, 2, 4, and 5.

C. T. D.

Daphne Mezereum, Paul's White. By E. A. Bowles (*Garden*, May 21, 1910, p. 255).—This is the best form of the white Daphnes. Though the plants are not long-lived, they are easily raised from seed. They are useful for contrasting with the red varieties and the purple-leaved form. The ground underneath may be carpeted with *Cyclamen Coum*, *ibericum*, and *Atkinsoni*, which flower at the same time and carry out the same colour effect.—*H. R. D.*

Demi-lysol, A New Insecticide. By Professor H. Zimmermann (*Oester. Gart. Zeit.* vol. v. pt. i. pp. 5-13).—Fruit trees and shrubs can be freed from scale by one winter spraying with a 10 per cent. solution of demi-lysol, followed by treatment with a 1 per cent. solution towards the end of May or beginning of June. Green fly, black fly, woolly aphis are also destroyed by one application of the 1 per cent. solution. To avoid damaging the foliage of apple trees it is advisable to use a $\frac{3}{4}$ per cent. mixture, spraying twice in the course of a week. Demi-lysol should be mixed with soft water. A 1 per cent. mixture containing equal quantities of demi-lysol and V_2 is particularly efficacious. Demi-lysol must not be used in conjunction with liver of sulphur, as the mixture damages the foliage.—*S. E. W.*

Dendrobium from Annam. By U. Dammer (*Orchis*, vol. iv. pt. i. pp. 9-11).—A *Dendrobium* (to which the author assigns the name

vexans) in Goldschmidt's collection has already been described in the "Gardeners' Chronicle." It resembles *D. aduncum*, but exhibits marked points of difference, particularly in the form of the lip.

S. E. W.

Dendrobium vexans. By U. Dammer (*Orchis*, vol. iv. pt. vi. pp. 85-87; 1 fig.)—The author confirms his previous statement that this orchid is the type of a new species.—*S. E. W.*

Diervilla praecox 'Floreal.' By Georges Bellan (*Rev. Hort.* Jan. 1, 1910, pp. 12, 13; col. plates and 1 woodcut).—The illustrations represent a very handsome corymb of bright rosy flowers much larger than the type and very showy. It flowers about the middle of May, somewhat later than the normal, but earlier than most other varieties, forming a link in the succession of inflorescence.—*C. T. D.*

Dipelta floribunda (*Bot. Mag.* tab. 8310).—Nat. ord. *Caprifoliaceae;* tribe *Lonicereae.* China. Shrub, 10-16 feet tall, resembling *Diervilla*; leaves 2-4 inches long; flowers axillary, clustered; corolla, pale rose, 2-lipped, $1\frac{1}{4}$ inch long, streaked with orange within, 1 inch across front.—*G. H.*

Disa grandiflora. By Böhme (*Gartenflora*, vol. lix. pt. xvii. pp. 374, 375; 1 fig.).—This orchid likes a temperature of 46° to 50° F. in winter, with a uniform degree of moisture. When the flower-stem appears move to a shady, airy, cool house, and spray frequently with cold water. It bears beautiful red flowers in May, June, and July. After flowering, the plant must be kept dry.—*S. E. W.*

Disease-resistant Varieties of Farm Crops. By W. A. Orton (*U.S.A. Dept. Agr. Year Book*, 1908; pp. 5; 2 plates).—The usual startling figures as to estimated losses from plant diseases in cereals are quoted. A general discussion of the reasons of resistance, nature of parasites, &c., follows, and a list of cottons, cow-peas, water-melons, wheats, &c., which have proved resistant are appended.—*E. A. Bd.*

Diseases in the Garden in 1910. By K. Schechner (*Oestr. Gart. Zeit.* vol. v. pt. xi. pp. 416-422; 3 figs.).—The wet season has been disastrous to tomato and celery crops. Tomato plants have been infested with *Phytophthora infestans*, accompanied by *Cladosporium fulvum*, while *Septoria Apii* produced brown spots on the celery leaves and checked the growth of the stalks. Spraying with Bordeaux mixture is the best method of combating these attacks. In cool houses the decorative *Pteris umbrosa* has suffered from the ravages of *Aphelenchus olesistus*, which destroys the tissues of the leaves and roots. These nematodes can be annihilated by boring holes in the soil, pouring in carbon di-sulphide, and closing the mouth of the holes. The soil can also be sterilized by boiling water.—*S. E. W.*

Diseases of Plants. By G. P. Clinton, ScD. (*U.S.A. Exp. Stn., Connecticut, Biennial Report*, 1907-1908).—The Report gives a survey

of climatic conditions for the years 1907-1908, and enumerates various fungoid diseases which have come under investigation during those two years, and further observations on diseases previously recorded. The Peach apparently suffered more than any other crop from both fungoid and physiological diseases. The probable causes of peach-yellows, or so-called peach-yellows, are then discussed. There are no less than four different theories as to the cause:—

1. Winter injury.

2. Lack of potash in the soil. The analysis of peach wood suffering from yellows showed a lack of potash.

3. The presence of some deleterious enzyme in the plant.

4. Germ theory, *i.e.* that the trouble is bacterial, although so far no definite organism has been found. Careful cultivation and the application of potash manures are suggested as preventives.

The second half of the report is taken up with an account of the investigations with regard to (*a*) the chestnut-bark disease, *Diaporthe parasitica*, which is doing so much damage to the chestnut trees in America, especially in the Eastern States; and (*b*) a paper on Artificial Cultures of *Phytophthora*, with special reference to oospores.

It was reported by Flora W. Patterson that the chestnut-bark disease was due to a *Cytospora*, but Dr. Murill found *Cytospora* to be the conidial stage of an ascomycete *Diaporthe parasitica*. It attacks chestnut trees of all ages. Old trees begin to die from the top downwards. On young trees and on the sprout growth, cankered areas show in the apparently healthy bark, and not infrequently girdle the tree. The presence of these cankered spots on the entirely smooth bark affords the best evidence that the disease is due to a fungus, and not entirely to winter injury followed by *Cytospora*, as some investigators were led to believe. The author is uncertain whether fruiting bodies of the fungus are developed on the cankered spots the first year, and this may explain why so many cankered spots show no fruiting bodies. On some, however, fruiting pustules develop in the summer in the form of tentacles, light orange-brown, but by the winter becoming dark chestnut-brown. The fungus has two spore stages, both of which develop in these pustules. The *Cytospora* stage usually appears during the autumn and continues into the spring. In the latter part of December the second, or winter, spore stage develops. The spherical spore receptacles are formed in the tissues at the base of the pustule and round its margin; they open to the exterior by long slender necks, which can be seen as small black spots on the surface. The asci contain eight oval to elongated ascospores, usually arranged in a single row. The spores are shed in winter and early spring. Artificial cultures were made on Lima bean agar, but the *Cytospora* stage alone developed. The writer is led to believe that winter injuries and summer droughts are important factors in handicapping trees against the depredations of the disease, and that the nature of the fungus is not such as to place it amongst the virulent parasitic forms. Metcalfe, however, believes that it is a virulent parasite, and that unless something inter-

venes it means the destruction of all the chestnuts in the Atlantic States. No efficacious treatment for the prevention of the trouble has yet been found.

(*b*) Investigations with artificial cultures of *Phytophthora* were carried out with two points chiefly in view:—

1. To obtain a perfectly satisfactory medium; Lima bean juice agar proved to be the best.
2. To determine if *Phytophthora* possesses mycelia of distinct sexual strains.

The writer inoculated Lima bean juice agar with mildews from different sources. Although the cultures were not extended enough to speak positively, no unusual mycelial development or formation of oospores was observed. Attempts at crossing *Phytophthora infestans* and *P. phaseoli* (the latter only is capable of producing oospores) gave rise to certain immature oogonia which were larger, somewhat thicker-walled, and of a darker colour than the ordinary oogonia of *P. phaseoli*. the oogonia were found at the junction of the two colonies, and within the area occupied by *P. infestans*. The author takes these results to mean that *P. phaseoli* grows more aggressively than *P. infestans*, and where it comes in contact with the latter has to form its oospores under unfavourable conditions, due to toxins in the media produced by *P. infestans*.

Plates showing the different stages of development of oospores in *Phytophthora phaseoli* are given.—*D. M. C.*

Diseases (Parasitic) of the Cinnamon Tree in Ceylon. By D. Bois and C. Gerber (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 109-116; with 8 figs.).—Two types of gall occurring upon the leaves of *Cinnamomum zeylanicum* are described in this paper. In the one type the gall usually forms conical projections upon the upper surface of the leaf and possesses a minute aperture on the lower side of the leaf. No deformation of the leaf is caused by this form of the gall.

The other type of this gall usually occurs upon the lower leaf-surface, and its apex is perforated by a small aperture. Considerable distortion of the leaf is caused by this form of the gall.

The interior of the gall is chambered and furnished with hairs. The gall is caused by a mite, *Eriophyes Boisii* Gerb., which is figured and described in this paper.—*R. B.*

Doubleness in Flowers: Petunia. By E. R. Saunders (*Jour. Gen.* i. pt. i. p. 57).—The double flowers of Petunia are described. In the breeding experiments which are detailed single Petunias belonging to the forms which were experimented with (viz. *Petunia violacea*, *P. nyctaginiflora*, *P. hybrida grandiflora*, and *P.* 'Countess of Ellesmere'), whether self-fertilized or crossed with each other, yielded only singles. Cross-bred singles derived from one single and one double parent produced singles only, whether self-fertilized or fertilized *inter se*. Singles crossed with pollen from a double yield doubles in the first

generation. The doubles have no functional gynæceum and yield no seed, but the stamens are functional. There is some evidence that more than one factor is concerned in determining the occurrence of singles and doubles.—*F. J. C.*

Draba ciliata. By J. Wood (*Garden*, June 4, 1910, p. 275).—This plant is considered worthy of notice and an acquisition to the rock garden. The flowers are white and the leaves form a dense cushion of green, the plant attaining a height of five to six inches. It is of easy growth and does not share with other Drabas the bad habit of dying off in places when two or three years old. *D. ciliata* is the most profuse flowering species and equally at home in the ordinary rock garden or on a dry wall, not being particular whether it is planted on a slope or on level ground. It would do for the edge of a border near the path, in company with mossy Saxifrages.—*H. R. D.*

Echeveria, Three New S. American Species of (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 204; April 1910).—Dr. Purpus, of the Botanical Gardens at Darmstadt, who spent the best part of the years 1907 and 1908 botanizing among the mountains of Puebla, particularly near Saint Louis Tultitlanapa and on the top of Crizaba, collected many new succulents in those regions. Of these, three new Echeverias—*E. gigantea*, *E. setosa*, and *E. subalpina*—are interesting to horticulturists, particularly the last, which forms rosettes 20 to 25 centimetres in diameter, the corolla being reddish-purple 12 millimetres wide with a yellowish centre, the petals being bordered with yellow.—*M. L. H.*

Elm Seedlings showing Mendelian Results. By Augustine Henry, M.A., F.L.S. (*Jour. Linn. Soc.* xxxix. 1910, pp. 290-300; 5 plates and 2 text figs.).—There are two species of elms in the British Isles—*Ulmus montana* With., and *Ulmus glabra* Miller. In addition to these two species there are many so-called varieties of elms, some of which are considered to be varieties of *U. glabra*, others being supposed to be distinct species. The most remarkable of these is the "English Elm," *Ulmus campestris* of English botanists. The author is of the opinion that this, like the other varieties of elm in England, is one of the descendants of the first cross between the two species, possibly due to a second hybridization of some of these descendants with *U. montana*.

The Huntingdon elm (*U. vegeta*) is most probably a first cross between *U. glabra* and *U. montana*. It is like most first crosses, extraordinarily vigorous, growing faster than any other elm. The Huntingdon elm originated as a seedling in a nursery at Huntingdon about 1746-56. Most of the characters of *U. glabra* are dominant in it. A great many other kinds of elms are known which vary in habit and foliage.

In June 1909 the author made extensive sowings of elm seeds. The first fact which he found was that only two kinds of elms give,

when sown, *uniform* seedlings. These are the two pure species *U. montana* and *U. glabra*. Every other kind of elm produces *mixed* seedlings which vary greatly from one another. Several sowings of the Huntingdon elm were made; 971 seedlings were counted as regards one character—namely, the possession of opposite or alternate leaves (the parent *U. glabra* has seedlings with opposite leaves, while the other parent has alternate leaves on its seedlings). It was found that 732 seedlings possessed opposite leaves, while 239 had alternate leaves. This agrees very closely with the Mendelian ratio 3 : 1.

Besides this other characters were noted in the Huntingdon seedlings, and some other varieties of elms were examined. These experiments, taken altogether, seem to show that what are called varieties are often only Mendelian combinations of two existing species. It is interesting to note that where only one species of a tree exists in a country varieties of this kind are never found (*e.g.* the beech).

In the case of the Black Poplars we have two true species, *P. nigra* and *P. deltoidea*, the latter introduced from North America. Soon after the introduction of *P. deltoidea* a first cross with the native species arose accidentally in France, and was later imported into England, where it became known as the Black Italian Poplar. This hybrid possesses astonishing vigour, and annually produces a large volume of timber. The author goes on to say that he believes it very likely that the Cricket-bat Willow is a first cross between *Salix alba* and *S. fragilis*. The history of the Lucombe Oak is also discussed. This arose in 1763 at Exeter from an acorn of a Turkey Oak (*Q. Cerris*) which had been pollinated by a Cork Oak (*Q. Suber*). This first cross holds the balance of characters between its two parents. One of its parents is deciduous, the other is evergreen; the hybrid is sub-evergreen, the leaves falling in January and February. The seedlings from the Lucombe Oak were very varied in their form and habit. The facts about the Lucombe Oak are strictly parallel with what is going on in the Elms.—*E. B.*

Enological Studies. By W. B. Alwood (*U.S.A. Dep. Agr., Bur. Chem., Bull.* 129, Nov. 1909).—This bulletin contains the results of two separate series of experiments:—

1. In processes of cider-making applicable to farm conditions.
2. In the use of pure yeast cultures in wine-making.

Accounts of these experiments are given in great detail, and are accompanied with tables of analyses, and discussion of the chemical and other data collected.

The use of pure yeast cultures in the fermentation of wines has three main advantages:—

1. To control the fermentation.
2. To expedite the process of fermentation.
3. To adapt specially selected yeasts so as to develop the special qualities of a must.

These advantages are important enough without the extravagant claims which have been put forward for pure yeast, which does not add

to a must qualities which it did not originally possess, nor can one hope to imitate particular wines by the use of yeasts selected from those wines.—*M. L. H.*

European Plants Growing without Cultivation in Colorado. By Francis Ramaley (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd part, 1910, pp. 493-504; with 1 map).—There are ninety-five species of European plants growing without cultivation in Colorado. Of these, twenty-six are garden escapes, while the rest have been introduced in various ways. New introductions are occurring from time to time, chiefly along the lines of railway. In railroad yards, especially where cattle and sheep are loaded, and along new embankments or where street grading is being done, introduced plants gain a foothold. Away from railway lines these plants follow waggon roads. The distribution of these plants, according to altitude, &c., is discussed, and a list of the species given.—*R. B.*

Fern Spores, Longevity of (*Garden*, Jan. 22, 1910, p. 38).—An instance of spores of *Cheilanthes mysuriensis* collected in China in October 1899, and preserved as herbarium specimens, germinating at Kew in March 1908, is recorded.

(*Garden*, Feb. 5, 1910, p. 62).—Another instance of spores of *Dicksonia antarctica* gathered in 1852, germinating in 1874, is given.

H. R. D.

Ferns, British, Various (*Brit. Fern. Gaz.* Nos. 3-6, 1910; figs.). Numerous papers and notes, especially on varietal forms of British ferns, the principal being (pt. 3) on *Lastrea Pseudo-mas cristata*; the decorative value of British ferns; the Jones and Fox collection in Clifton Zoological Gardens; (pt. 4) raising *Lastrea montana* from spores; plumose varieties of ferns; (pt. 5) the common Bracken; cresting in ferns; (pt. 6) pedigree of *Athyrium felix-foemina kalothrix;* a cool-house fernery.—*F. J. C.*

Ferns, Filmy. By F. W. H. (*Garden*, May 7, 1910, p. 228; 2 figs.).—Though not suitable for cultivation in many gardens, these ferns might in many instances be accommodated. They take their name from the film of moisture which covers their fronds in the growing season. The family is not large, the three principal genera being *Hymenophyllum*, *Trichomanes*, and *Todea*, but there are many species and varieties, the majority being natives of New Zealand and Australia. In the United Kingdom we have representatives of the two first families, the Killarney fern (*Trichomanes radicans*) and the Tunbridge Wells fern (*Hymenophyllum tunbridaense*) and the one-sided filmy fern, *H. unilaterale*. They are usually found in deep mountain recesses near running water.

In this country it is generally necessary to provide them with a glass case in a cool greenhouse. Frost must be kept away in winter, but the cooler they are in summer the better. At Messrs. Backhouse's nursery

an underground fernery is devoted to them, and at Kew a small house with glass cases.

They may be divided into two classes, those with a creeping stem and those without. The creeping plants like to spread over damp, cool sandstone or old tree ferns; the others may be planted in chinks. The chief points to be attended to in their culture are heavy shading and frequent pouring of water among the rocks, not on the fronds, and cool treatment in summer.—*H. R. D.*

Ferns in Parks and Gardens. By W. Würth (*Oestr. Gart. Zeit.* vol. v. pt. x. pp. 361-365; 4 figs.).—Barren corners of the garden should be planted with *Aspidium Filix-mas* and *Athyrium Filix-foemina*. *Osmunda regalis*, *Onoclea Struthiopteris*, *Aspidium Thelypteris*, *Aspidium cristatum*, and *A. spinulosum* like a damp situation, and soil rich in humus.

Polypodium Phegopteris, *P. Robertianum*, and *P. Dryopteris* grow well among decaying trees and bushes.

Pteridium Aquilinum flourishes in a light, sandy soil. *Ceterach officinarum*, *Asplenium Trichomanes*, *A. septentrionale* (dislikes lime), *A. rutamuraria* and *A. Adiantum-nigrum* thrive well in dry, sunny, stony places. *A. viride*, *Allosurus crispus*, *Scolopendrium officinale*, *Blechnum spicant*, *Polypodium vulgare*, *Aspidium Lonchitis*, and *Asplenium aculeatum* var. *lobatum* prefer the shade of rocks.

Woodsia ilvensis likes a sunny place among rocks, but dislikes lime. *Crystopteris fragilis*, *C. sudetica*, and *C. montana* like a moist, shady position on rocks.

Ophioglossum vulgatum grows in moist meadows, and *Botrychium Lunaria* is found on dry sunny slopes.—*S. E. W.*

Fig, A New Anthracnose of. By Stevens and Hall (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 2, p. 65; 1 plate).—Describes a new disease of the fig in the eastern parts of North Carolina, the chief characteristics of which are a rot and premature fall of the fruit. In general character the rot resembles the "bitter-rot" of the apple. A species of *Colletotrichum* was found constantly associated with the disease, which presented no difficulty as regards isolation in pure culture. Infection experiments with pure cultures were carried out both in the laboratory and in the field, and successful inoculations were easily made when the atmospheric moisture was plentiful, but only with difficulty in dry air. The disease occurs naturally only in specially moist localities and on the sea-coast. The fungus isolated does not agree in its characters with any previously described species of *Colletotrichum*, and the authors therefore name it *C. Carica*, n. sp., and append a specific description.—*G. H. P.*

Flavouring Extracts, The Manufacture of. By E. M. Chace (*U.S.A. Dept. Agr. Year Book*, 1908; pp. 4; 4 plates).—An account of cultivation of flavouring plants, with details of the manufacture of their products.—*E. A. Bd.*

Flora of Pondikonisi. By C. Sprenger (*Oester. Gart. Zeit.* vol. v. pt. i. pp. 3-5).—The small island of Pondikonisi, or Mouse Island, off Corfu, contains no trees and few plants that are indigenous. The following are native: *Osiris alba*, *Arundo Pliniana*, *Smilax aspera*, *Phlomis fruticosa*, *Foeniculum vulgare*, *Artemisia arborescens*, *Antirrhinum majus*, *Arum italicum*, and *Arisarum vulgare*.—*S. E. W.*

Floral Art of Japan. By H. Pudor (*Gartenflora*, vol. lix. pt. xii. pp. 253-259, and pt. xiv. pp. 302-305).—The author gives the rules governing the arrangement of flowers in Japan.—*S. E. W.*

Flower Gardens and Pleasure Grounds. By H. Reid (*Agr. Gaz. N.S.W.* vol. xxi. pt. vi. pp. 492-498; 2 plates).—The author recommends geometrical designs for flower beds, and gives general directions for cultivation.—*S. E. W.*

Forage Crops, A Search for New Leguminous. By C. V. Piper (*U.S.A. Dep. Agr. Yearbook* 1908, 6 pp., 6 plates).—A description of experiments made to test the value of certain leguminous plants. The following are illustrated and described: Lyon bean (*Mucuna Lyoni*), Kudzu (*Pueraria Thunbergiana*), Brabham cow pea, Tangier pea (*Lathyrus tingitanus*), Adzuki beans (*Phaseolus angularis*), Bonavist (*Dolichos lablab*), Hindu cow peas (*Vinga Catjang*).

E. A. Bd.

Forests of Alaska. By R. S. Kellog (*U.S.A. Dep. Agr., Forest Service, Bull.* 81, 1910).—The author gives an interesting description of these little-known forests, with the climate, physical features, and the dominating species of trees. The future of Alaska forests is also considered, and practical suggestions made as to what should be done in the matter of protection, and in order to render them of the greatest value as timber producers.—*A. D. W.*

Forests, The Life History of Lodgepole Burn. By F. E. Clements (*U.S.A. Dep. Agr., Forest Service, Bull.* 79, 1910).—The life-history of the burned areas of Estis Park—a typical forest area of Northern Colorado—is interesting reading. Seed distribution by squirrels and birds, and often forest fires, would appear to be the principal means by which regeneration of these burnt-out forests is brought about.—*A. D. W.*

Forcing. By St. R. V. Ramult (*Oester. Gart. Zeit.* vol. v. pt. viii. pp. 295-302).—The period of rest which a plant must endure before it can be induced to flower long before its natural season may be brought about by (1) exposure to the vapour of ether or chloroform; (2) immersion in warm water; (3) exposure to a temperature below the freezing-point of water.

Etherization yields the best results in October and November. The operation is carried on in an air-tight chamber or vessel at a temperature of 60° F. to 64°. The plants are removed from the ground some time before they are brought into the chamber in order

that the soil may dry. The balls of soil round the roots of the pots are covered with dry sand. Ether or chloroform is poured into a shallow dish and the chamber closed. After 60 hours' treatment (or longer if it is a wet season) the plants are brought into a forcing-house at 50°-68° and well watered; after 5 days the temperature is raised to 77°-82° F. About 1½ oz. of ether is required for a vessel having a capacity of 22 gallons. In frosty weather a smaller quantity will suffice. A mixture of 4 pints by weight of ether with 1 of chloroform yields good results.

Lilacs can be prepared for forcing by immersion in warm water (95° F.) for 10 hours.—*S. E. W.*

Forest Flowers in the Garden (*Gartenflora*, vol. lix. pt. xviii. p. 400).—It is best to move forest plants in autumn, with a good ball of soil. Plant in a shady spot and cover with leaves or leaf mould.

S. E. W.

Fouquiera splendens (*Bot. Mag.* tab. 8318).—Nat. ord. *Fouquieraceae*. Northern Mexico and South-Western United States. Shrub 6-20 feet high, branched with spines; leaves 1¼ inch long; inflorescence terminal, 4-6 inches long, many-flowered; sepals 4 inches long, green; corolla with straight tube, ¾ inch long, with reflexed limbs, red; stamens 15, much exserted.—*G. H.*

Freesias, Hybrids of Bruggemani. By R. Zeissig (*Die Gart.*, August 27, 1910, p. 433).—Since the introduction of the pink flowered *Freesia Armstrongi* from South Africa a number of hybrids have been raised in Holland, England, and France by crossing *F. refracta alba*, *F. Leichtlini*, and *F. Armstrongi* with results that at present there are several forms in culture of lilac, rose, and pink flowers with the fragrance of the old type of Freesia. The *Bruggemani* hybrids are said to surpass those raised in Holland and England.—*G. R.*

Fruit-flies in New South Wales. By W. B. Gurney (*Agr. Gaz. N.S.W.*: vol. xxi. pt. v. pp. 423-433; 8 figs. 1 plate).—The Common, or Mediterranean, Fruit-fly (*Ceratitis capitata*), with the occasional exception of prickly pear, does not develop in the wild fruits of New South Wales. Infected orchard fruit should be burnt or boiled.

Queensland Fruit-fly (*Dracus Tryoni*) is a native of New South Wales and Queensland, and develops in four wild fruits. It is destroyed by an internal parasite, a small red-and-black braconoid wasp.

The Island Fruit-fly (*Trypeta musae*) prefers native to cultivated fruits, and rarely attacks sound ones.—*S. E. W.*

Fruit Fly Remedy, The Mally. By Mr. P. S. du Toit (*Agr. Jour. Cape G.H.*, Feb. 1910, pp. 146, 147).—In Graaff-Reinet they have obtained good results by bringing into practice the theory of Mr. Mally by making experiments in the spraying of peach-trees with arsenate of lead and black sugar against the peach-fly (Fruit Fly). The local Fruit Growers' Association having induced them, the people

ardently started applying a light spraying to the trees during the months of October and November, with the result that a very small percentage of fly-damaged fruit has been found. Where early spraying of pear and apple trees was started the crop has been a complete success.

It is interesting to note that, so far as can be ascertained, this remedy has proved quite harmless to bees. It is also worthy of note that a remedy on similar lines is coming into use in Europe, and is reported to be highly successful, against the ravages of a fly which attacks olives in the same manner as that adopted by the fruit fly against peaches. It is also highly probable that this remedy will prove equally efficacious for the fly-pest which produces maggots in pumpkins, melons, marrows, &c., and causes such heavy losses in these garden crops.—*A. A. K.*

Fruit Trees, Dwarf, for Small Gardens. By A. S. Neilson (*Jour. Agr. Vict.* June 1910, pp. 403-404). For Apples, the 'Doucin,' or 'French Paradise,' is first grafted on to the 'Northern Spy,' so as to give the tree a sound, blight-proof root system, then the particular variety desired is worked on to the 'Paradise.'

In Pears the quince is used as the root stock; on this is worked an intermediate stock, such as 'Beurré d'Amanlis,' 'Louise Bonne of Jersey,' or 'Jargonelle.' On this intermediate stock the particular variety desired is worked.

In Cherries the 'Mahaleb' stock is used; as it is of a dwarf nature itself, the varieties selected are grafted or budded straight on to it.

Plums, by judicious root-pruning, can be kept down, and thus dwarfed to a certain extent. Root-pruning is done by digging a spade-wide trench about 18 inches from the stem of the tree all round, and to the depth of about 18 to 24 inches. Chisel in under the tree, so that the ball of earth containing it will swing as if on a pivot, thus cutting all the roots and checking the growth for the purpose required. The soil should then be replaced and well trodden in; the addition of a handful of bone dust or superphosphate will be an advantage. This procedure should be followed every second or third year, according to the growth the tree makes. Trees thus treated may be planted 6 to 8 feet apart.—*C. H. H.*

Fruit Planting, The Profits of. By A. Janson (*Oester. Gart. Zeit.* vol. v. pt. ii. pp. 47-55, pt. iii. pp. 86-90, pt. iv. pp. 131-142; 1 diagram).—Directions are given for calculating the profits of fruit-farming in Germany and Austria.—*S. E. W.*

Fruit Trees in the Elbe Valley in Bohemia, Part II. (*Oester-Gart. Zeit.* vol. v. pt. i. pp. 14-19, and pt. iv. pp. 142-146; 1 fig.).—In 1905 a census of fruit-trees in the Bohemian Elbe valley gave the following results: 1,605,080 plum-trees, 614,560 pear, 577,497 apple-trees, 246,506 cherries, 32,248 walnut, 14,594 apricot, 4,406 peach-trees, 117,118 gooseberry and 77,934 currant bushes.—*S. E. W.*

Fruiting of Seedling Fruits in Order to Judge their Quality. Means of Hastening the. By Ernest Baltet (*Pom. Franç.* Avril 1910, pp. 207-213).—Pears and apples raised from seed in the ordinary course produce fruit after eight to fifteen years. Stone fruit comes into bearing earlier, peach trees becoming covered with flowers from their fourth or fifth year, when they are not pruned. In order to hasten, sow the seeds in pots, prick out when plants have developed their first leaf above the cotyledons, transplant frequently, and water with plain water and occasionally with liquid manure.—*C. H. H.*

Fruits, Degeneration in Varieties of. By G. Duval (*Pom. Franç.* Juin 1910, pp. 175-182).—The chief cause appears to be age: some of the varieties, like 'Duchesse d'Angoulême' and 'Beurré Diel' pears and 'Reinette Blanche de Canada' and 'Court Pendû Plat' apples, which used to be of strong constitution, are now 100 or 150 years old. Climate also is more favourable to certain varieties. New varieties have to be obtained from seed, choosing as parents the best varieties, the most vigorous, and freest from disease.—*C. H. H.*

Fruits, New. By W. A. Taylor (*U.S.A. Dep. Agr. Year Book*, 1908; pp. 9; 9 plates).

Apple 'Patten.'—A hardy variety suited to Canadian conditions. 'Bennett.'—Of the 'Winesap' race, but early and heavy bearer. 'Williams' Favourite.'

Peach 'Augbert.'—Combines the productiveness and carrying quality of the 'Elberta' with the better quality of the 'Salway.' 'Champion.'—Stands low temperatures in winter.

Raspberry 'Eaton.'—Fruit gathered six times between June 20 and August 10; hardy.

Mango 'Peters.'—A variety from Trinidad.

Persimmon 'Lonestar' and 'Kawa Kami.'—Two new varieties have the merit of losing their astringency whilst still firm.

Pecans.—Four new varieties are figured.—*E. A. Bd.*

Fruits, New. By W. A. Taylor (*U.S.A. Dept. Agr. Year Book*, 1909; 5 col. plates).

Apple 'Mother.'—Though not new, it is now found to be adaptable to a greater climatic range than at first supposed. 'Coffman.'—An early and highly coloured variety.

Currant 'Diploma.'—A prolific seedling.

Gooseberry 'Carrie.'—Small to European eyes, but said to be prolific and disease-resisting.—*E. A. Bd.*

Fruits, Problems in the Pollination of. By S. A. Beach (*U.S.A. Hort. Soc. Illinois, Trans.*, 1909, new ser. vol. xliii. pp. 67-77).—The writer groups the causes of self-sterility under four heads:—

Anthers and stigmas maturing at different times;
Unequal length of stamens and pistils;
Defect in the essential organs; and
Lack of affinity between the sex cells.

While the grape has been studied for a good many years with the result that some 200 varieties can be classed as self-fertile or self-sterile, we have comparatively little certain knowledge about orchard fruits in this respect, and much investigation remains to be done. The effect of environment is discussed in this connexion, and it is recommended to plant orchards so as to secure, or at least facilitate, cross-pollination, whether the varieties are self-sterile or not, the writer stating that it has been demonstrated that self-fertilized fruits do not grow so large as those resulting from cross-fertilization, though apparently he does not regard this as true of all varieties.—*A. P.*

Fruits, Two New. By L. C. Baltet (*Oester. Gart. Zeit.* vol. v. pt. vi. pp. 222-224; 2 figs.).—'Lexington' is a new pear which is ripe in the latter half of September. It has a sweet and aromatic flavour. 'Bishop,' an American peach of vigorous growth is a good cropper. The fruit is juicy and has an exquisite flavour and aroma. In the South, North, and West of France the peach 'Victor' is the earliest, and gives the best results.—*S. E. W.*

Fungicides, Experiments on the Apple with some New and Little-known (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 58).—The writer does not recommend the general use of the new fungicides mentioned in this circular until further investigations have been made; but so far the experiments carried on have shown that with all fungicides containing copper injury occurs through burning of the leaves and russeting of the fruit in greater or less degree. The use of Bordeaux mixture in the case of Yellow Newtown caused 80 per cent. of russeting, which is serious.

On the other hand, a new form of copper sulphide prepared from self-boiled lime-sulphur (10—10—50 gallons) as a basis, and Bordeaux (3—3—50) was found to be the least injurious of the copper sprays, the burning being about one-sixth of that caused by Bordeaux alone. To 50 gallons of all the sprays 2 lb. each of arsenate of lead was added. When used alone, arsenate of lead, besides being an insecticide, seemed to possess considerable fungicidal value, though probably not enough to be depended upon for general use.

A new iron sulphide fungicide made by mixing self-boiled lime-sulphur (10—10—50) and 3 lb. copperas or iron sulphate proved entirely satisfactory. It gave remarkably good results as a fungicide, and proved absolutely harmless as regards burning. The leaves of the sprayed trees were a deeper green, and the shoots and buds plumper. The fruit was slightly greener, and apparently a little later in ripening. In some varieties this might be a drawback unless it were obviated by allowing the fruit to hang a little longer.—*D. M. C.*

Funkias. By E. Gienapp (*Oester. Gart. Zeit.* vol. v. pt. iii. pp. 105-108).—Funkias are strongly recommended for decorative purposes, especially *Sieboldi, undulata variegata, japonica gigantea, marginata, viridis marginata, ovata, medio picta, alba marginata*, and

univittata. The beauty of the foliage is enhanced by cutting off the flower stems as soon as they appear. Ferns should not be removed frequently.—*S. E. W.*

Furcraea, Observations on. By William Trelease (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 905-916; 14 plates).—In this paper the monocotyledonous genus *Furcraea* is described in considerable detail. Its external morphology and internal structure are contrasted with those of the nearly allied genus *Agave*. The fourteen beautiful plates form a conspicuous feature in this memoir.—*R. B.*

Gamogyne pulchra (*Bot. Mag.* tab. 8330).—Nat. ord. *Aroideae*; tribe *Philodendreae*. Malaya. Herb, perennial; leaves sub-erect, 8 inches long, blade tapering below and lanceolate, included in purple stipules below; spathe horizontal, bright crimson, $1\frac{3}{4}$ inch long, $\frac{3}{4}$ inch broad, on a stalk 6 inches long.—*G. H.*

Gardening, Books on, Some Old English Translated from French. By M. C. Harman Payne (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 438; July 1910).—The writer of this note has been at some pains to hunt up the originals of several of the English herbals and books on gardening, published in this country in the seventeenth and eighteenth centuries, which were taken from the French with or without acknowledgments. In some cases the English book was a bare translation, in some was adapted from the French, and in some was compiled from one or two French works. Mr. Payne gives the full name and date of each of these English books and that of the French original whenever he has been able to trace it.—*M. L. H.*

Gardening in the History of Mankind, The Part Played by. By E. Hahn (*Gartenflora*, vol. lix. pp. 346-353).

Garden Pests. By O. Cordel (*Gartenflora*, vol. lix. pt. ii. pp. 43-46).—Washing apple-trees twice a week with a powerful jet of water, from the end of May to July, removes the eggs of the codling moth (*Carpocapsa pomonella*), but is ineffectual in the case of the apple sawfly (*Hoplocampa testudinea*). The plum sawfly (*H. fulvicornis*) and the gooseberry sawfly can be destroyed by spraying with lime-water or milk of lime as soon as the blossom falls.—*S. E. W.*

Gardens and Plantations in German Tropical Lands. By A. R. Elbeck (*Oester. Gart. Zeit.* vol. v. pt. vii. pp. 266-271).—In East Africa the most important cultivated crop is Egyptian cotton; next come hemp from *Agave filifera*, *Sansevieria guineensis* and *S. zeylanica*; coconuts; indiarubber, cocoa, and coffee in small quantities. Bananas and other varieties of fruit are also grown. In South-West Africa the chief products are maize, wheat, tobacco, cotton, indigo, grapes, oranges, figs, and other fruit. In Togo coconuts, sisal hemp, cocoa, tobacco are cultivated with success. In German Cameroon the chief industry is in cotton, indiarubber, grain, kola, and

oil. A satisfactory attempt at growing tobacco has been made. In Kiao-Chao, in the province of Shantung, farming is actively carried on, yielding large crops of rice, wheat, beans, cotton, tobacco, hemp, and opium.—*S. E. W.*

Gentian Seed. By J. T. S. (*Garden*, Sept. 17, 1910, p. 446).—This seed should be sown early in October. If sown as soon as ripe (the usual recommendation) the seeds lie much longer in the ground than if they are kept for a few weeks.—*H. R. D.*

Gipsy Moth Parasite Laboratory, Technical Results from. By L. O. Howard, Ph.D. (*U.S.A. Dep. Agr., Bur. Entom., Tech.* ser. 19, pt. i., Jan. 1910; 7 figs.).—This paper deals with the parasites reared, or supposed to have been reared, from the eggs of the gipsy moth, and gives some of the systematic and biological results of the work. It forms the first of a series, and describes several new egg-parasites.—*V. G. J.*

Gladiolus gandavensis 'Europa' (*Oester. Gart. Zeit*, vol. v. pt. x. pp. 365, 366).—'Europa' is a gladiolus of healthy growth, with a strong stem, which may bear as many as twenty-four beautiful snow-white flowers, half of which are open at the same time. It is valuable for cut flowers.—*S. E. W.*

Gladiolus gandavensis 'Europa.' By F. Reutersheim (*Gartenflora*, vol. lix. pt. xxii. pp. 498-500; 1 fig.).—This gladiolus, brought out by W. Pfitzer, of Stuttgart, is valuable as a cut flower, as it is pure white and lasts many days in water.—*S. E. W.*

Glass Traps for Insects. By H. Zimmermann (*Oester. Gart. Zeit.* vol. v. pt. iii. pp. 90-92).—Bottles containing beer, or the special glass traps of Brossart, charged with beer, should be placed in orchards during the summer months, as they capture large numbers of wasps and hornets.—*S. E. W.*

Gloeosporium Rot of Bananas and the Spotting of Ivy Leaves by Gloeosporium and Phyllosticta. By R. Laubert (*Gartenflora*, vol. lix. pt. xix. pp. 409-415; 2 figs. 1 col. plate).—The black marks on banana peel are caused by *Gloeosporium* attacking the fruit during transport. Every effort should be made to avoid bruising and to keep the bananas cool and dry, giving plenty of ventilation.

Phyllosticta hedericola causes dark brown spots on ivy-leaves, which, with the aid of a lens are seen to consist of a series of concentric rings. *Gloeosporium paradoxum* generally attacks the edge of the leaf, causing a brown discoloration. In either case the leaves should be collected and burned.—*S. E. W.*

Gloxinia, A Double. By Eug. Vallerand (*Rev. Hort.*, June 1, 1910, pp. 254-255; col. plate).—The plate depicts a very promising double form of Gloxinia, somewhat resembling a double Petunia, white, sparsely dotted with magenta internally. The plant appears to have

resulted, after years of cultivation and hybridization, of abnormal flowers, a number of perfect doubles appearing on a batch of variants. It was raised by M. Vallerand, but no name is given.—*C. T. D.*

Graft Hybrids. By W. Heuer (*Gartenflora*, vol. lix. pt. xx. pp. 434-442; 3 figs.).—The hybrids of *Solanum Lycopersicum* and *S. nigrum*, *S. Melongena*, and *S. Dulcamara* are described and illustrated.—*S. E. W.*

Graft Hybrids. By W. Nienburg (*Gartenflora*, vol. lix. pt. xxii. pp. 479-485; 4 figs.).—Winkler obtained hybrids of *Solanum Lycopersicum* and *S. nigrum* by inserting a wedge-shaped graft of *S. nigrum* into *S. Lycopersicum* stock. When union between stock and scion is complete, the graft is cut back so as to leave only a small wedge of the scion in the stock. After the wound has healed, young shoots appear, but all are removed excepting those which spring from the parts where the tissues of the stock and the scion are in juxtaposition. In this way two hybrids were obtained, *S. Koelreuterianum* and *S. tubingense*. They can only be propagated from cuttings, not from seed. Baur's research on the white-edged zonal pelargonium threw light on the nature of these hybrids. *S. tubingense* must be regarded as *S. nigrum* surrounded by a layer of *S. Lycopersicum* cells. In *S. Koelreuterianum* the case is reversed; cells of *S. Lycopersicum* are surrounded by a layer of *S. nigrum* cells.—*S. E. W.*

Grafting, Influence of Scion on Stock. By Louis Henry (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 58).—The vexed question of intercrossing between scion and stock is here considered from the point of view of the possibility of the scion affecting the stock. Apparently authentic cases are cited where shoots have appeared upon the stock below the graft bearing unmistakable traces of the influence of the scion, and it is stated that certain well-known hybrids, the 'Medlar of Brouvaux' *Crataegomespilus Dardari* Simon Louis, *Citrus Bizarria* Riss. and Poit., and *Cytisus Adami* Poit., were produced in this way after accidental removal of an old-established scion.—*M. L. H.*

Grafts, Seed Stock and. By A. Janson (*Oester. Gart. Zeit.* vol. v. pts. 1 and 2, pp. 24-28, 63-69).—By careful selection of seed from the best-grown plants an improvement in the race can be effected: in the same way, great attention should be paid to the selection of grafts. In the case of fruit trees, these should be chosen only from healthy trees which have borne well-flavoured fruit. The stock is merely the means of supplying the upper part of the tree with the nourishment which the roots draw from the soil. Dwarf stock, such as Paradise, limits the supply, consequently the growth of the tree is checked, and fruit-bearing takes place earlier than is the case when the crab is used as stock. The stock should be grown from seed.

S. E. W.

Grape Investigations: Resistant Stocks, &c. By G. C. Husmann (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 172, Aug. 1910; plates and map).—The most important means of overcoming *Phylloxera*, next to flooding the vineyards, is the use of resistant stocks. Of the twenty-three species of vine native in North America, where *Phylloxera* is also native, fourteen are sufficiently resistant for use as stocks. These are described and their foliage figured in the bulletin. They are *Vitis Labrusca* (Northern fox-grape), *V. candicans* (Mustang grape), *V. aestivalis*, *V. Linsecomii*, *V. monticola*, *V. Berlandieri*, *V. cordifolia*, *V. cinerea* (=*V. riparia*), *V. Champini*, *V. Doaniana*, *V. Longii*, *V. rupestris*, *V. vulpina*, and *V. bicolor*. A large number of hybrids have also been raised, which have proved resistant. The work on which progress is reported here is directed to ascertain which varieties of vine (*V. vinifera*) are best adapted to various soils, climates, and other conditions (which can be fairly readily forecasted), and particularly which stocks are congenial to the scions under these varying conditions. The rooting qualities and ease of grafting vary greatly in different species, and the hybrids vary in these and other characters from their parents.

It is found that cuttings of *V. monticola*, *Berlandieri*, *aestivalis*, *Linsecomii*, *bicolor*, and *candicans* are difficult to root; V. *riparia* roots readily, but is not suited to Californian conditions; *V. rupestris* roots and grafts well, but is not congenial to many varieties of grapes, and the time of fruit-ripening is delayed. *V. riparia*, *V. Berlandieri*, and *V. Champini* are usually congenial to varieties of grapes, and the fruitfulness of the grape upon them is usually increased and the time of ripening hastened. It is thought that hybrids between *V. rupestris* and *V. riparia* will eventually prove the best stocks for Californian grapes.—*F. J. C.*

Green Manuring of Orchards. By E. E. Prescott (*Jour. of Vict.* March 1910, p. 158).—Sow in autumn leguminous crops, field peas, vetches, tares, beans, lupins, cow peas, seed liberally, and 1 cwt. superphosphate or bone meal. When crop is in flowering stage, roll and plough in, using circular coulter in front of the plough-share. If dry weather follow, well harrow and roll, to retain moisture. Humus and nitrogen are added and physical texture of soil improved.—*C. H. H.*

Hazel, Birch, and Alders (*Oester. Gart. Zeit.* vol. v. parts vi., vii. and x., pp. 216-222, 255-259 and 368-371).—The family Betulaceae contains six genera. *Ostropsis Davidiana* is a shrub widely distributed in Asia. *Ostrya Knowltonii* is only found in the Grand Cañon, Colorado. *O. carpinifolia* is found in the countries bordering on the Mediterranean. *O. virginiana*, met with in many gardens, is a native of North America, extending from New Brunswick to Wyoming and North Mexico; a sub-species, *guatemalensis*, occurs in Mexico, Costa Rica, and Guatemala. About 200 species of *Caripnus* are known. The common Hornbeam and its varieties *incisa*, *pendula*, and *purpurea* are well known. *C. japonica* and *C. cordata* are beautiful Japanese

varieties. *C. Turczaninowii* var. *polyneura* from W. China is perhaps the most beautiful of all, with elegant foliage and fruit.

Corylus Avellana is the common hazel. *C. Colurna* is widely distributed in Europe and Asia. *C. maxima* or *tubulosa* bears larger nuts. From North America we get *C. americana*, also known as *humilis* or *serotina*, and *C. rostrata*. *C. ferox* from Nepaul and Sikkim attains a height of 33 feet, and bears its nuts in clusters, which are protected by long spikes. *C. heterophylla* grows in Manchuria, E. Mongolia, Korea, and Japan. *C. pontica*, a variety of *C. Avellana*, is found in the neighbourhood of Trebizond. The nuts form an important article of commerce in Asia Minor. *C. Sieboldiana* from Japan, *C. mandschurica* from Korea and Manchuria, *C. californica* from California, Washington, and Oregon, and *C. Fargesii* from Central China, are all varieties of *C. rostrata*. *C. calyculata* is a variety of *C. americana*, and *C. tibetica* is a variety of *C. ferox*. Three varieties of *C. heterophylla* were discovered in China in 1899, namely, *sutchuensis*, *yunnanensis*, and *Crista-galli*. A large tree growing at an altitude of 6,000 to 7,000 feet in Yunnan, formerly described as *Tilia chinensis*, appears to be a variety of *C. Colurna*. *C. intermedia* is a hybrid derived from *C. Avellana* and *C. Colurna*.—*S. E. W.*

Hemp, The Cultivation of, in the United States. By L. H. Dewey (*U.S.A. Dep. Agr., Circ.* 57; 7 pp.; 1 plate).—An account of distribution, cultivation, harvesting profits, &c. On the latter point the net profit is estimated at $20 from an acre.—*E. A. Bd.*

House Flies and Formalin. By C. French (*Jour. Agr. Vict.* July 1910, p. 480).—To suppress flies, take a soup-plate and cut a couple of sheets of thick blotting-paper to fit into the bottom; half an inch of clean damp sand under the blotting-paper will help to retain the moisture on a hot day. Saturate the paper with water and sprinkle it over, first with sugar, then with a quarter of a teaspoonful of formalin (diluted with a spoonful of water, so that it will spread all over the exposed surface). Place the plate in a well-lighted spot, preferably on the floor, and the flies, attracted by the sugar, are quickly affected by the formalin, and usually drop dead on the side of the plate. Formalin, however, evaporates after a time, so it may be necessary on a hot day to renew it at intervals.—*C. H. H.*

Hydrilla sp. hortus Henkel. By F. Henkel (*Gartenflora*, vol. lix. pt. iv. pp. 84-45; 1 fig.).—A beautiful water-weed, valuable for an aquarium, is described, with a sketch. It is sold under the incorrect name of *Hydrilla verticillata*, from which it exhibits marked points of difference.—*S. E. W.*

Insect Foes of the Onion, Leek, and Garlic. By Pierre Lesne (*Rev. Hort.*, June 16, 1910, pp. 281-284: col. plate).—A very interesting article on the various insects which attack these vegetables, the plate showing them in their various states, and the letterpress de-

scribing their modes of attack, life histories, and the means of preventing their scourges.—*C. T. D.*

Insects, Friendly. By W. W. Froggatt (*Agr. Gaz. N.S.W.* April 1910, pp. 335-346; 2 plates, 15 figs.)—The life-history of the friendly insects is described, with illustrations, viz.: the ladybirds, green lace wing (*Chrysopa ramburii*), brown lace wing (*Micromis australis*), hover fly (*Psylopus sydneyensis*), the golden-faced fly (*Sarcophaga aurifrons*), ichneumon flies, braconid wasps (*Ephedrus persicae*), chalcid wasps, vine moth bug (*Oechalia schellembergi*), and the mantis.—*S. E. W.*

Insects of Field Crops. By R. H. Pettitt (*U.S.A. Exp. Sta. Michigan, Entom. Bull.* 258, Feb. 1910; 51 figs.).—The present bulletin is the third of a series dealing with the insects affecting different classes of crops. It deals with the insects of field crops in Michigan, and gives preventive and remedial measures.

The insects described are those which attack wheat, clover, beans, peas, grain, seeds, &c., and the excellent illustrations should be of great assistance to the agriculturist.—*V. G. J.*

Irrigation in Colorado. By C. W. Beach and P. J. Preston (*U.S.A. Dep. Agr. Off. Exp. St., Bull.* 218, 1910.—The advantages of farming under irrigation are described by the writer, and the number of crops that could not otherwise be cultivated are successfully grown under this method of treatment are pointed out. Estimates of establishing a good irrigated fruit farm are given—useful information to those who contemplate fruit farming in Colorado.—*A. D. W.*

Iris Clarkei (*Bot. Mag.* tab. 8323).—Nat. ord. *Iridaceae;* tribe *Irideae.* Sikkim. Herb, 3 feet high; leaves 10-24 inches long; perianth, purple-violet, variegated, 3 inches across; style arms and crest blue.—*G. H.*

Iris Hybrids. By G. T. Grignan (*Rev. Hort.*, March 1, 1910, pp. 180-9; col. plate).—The plate represents *Iris Monspur*, purple, *Iris Monnieri* × *Iris spuria*, of which names that of the hybrid is a combination; and *Iris ochraurea*, pale yellow standards, named on same principle from its parents, *I. ochroleuca* × *I. aurea*; both robust and good.—*C. T. D.*

Iris tingitana. By W. Fitzherbert (*Garden*, July 16, 1910, p. 350).—Mr. Elwes, referring to the cultivation of rare foreign plants, once remarked that in this country they require rich soil in order to make up for the change in temperature, and he gave as an instance this Iris, which grows in sand near Tangiers, but can only be kept in health here by rich food. The writer having grown this Iris for some years without flowering it, altered his method. He placed a layer of manure eight inches below the surface, the upper soil being mixed with equal parts

of an old mushroom bed. This produced a satisfactory flowering. He finds it expedient to lift the Iris when the foliage dies back and plant it again in October.—*H. R. D.*

Irritation of the Skin, Plants Producing. By F. Kanngieser (*Gartenflora*, vol. lix. pt. viii. pp. 176-181).—The skin may be irritated by contact with the following plants: *Aconitum Napellus*, *Allium sativum*, *Anacardium occidentale*, *Anemone Pulsatilla*, *Arum*, *Bignonia*, *Caltha palustris*, Capers, *Citrus vulgaris*, *Clematis Vitalba*, *Cyclamen europaeum*, *Cypripedium parviflorum*, *C. pubescens*, and *C. spectabile*, *Daphne* (especially *Mezereum*), *Drosera rotundifolia*, *Eucalyptus Globulus*, Euphorbiaceae, *Ficus Carica*, *Hedera Helix*, *Heracleum giganteum*, *Humulus Lupulus*, *Hyacinthus orientalis*, *Iris*, *Juniperus Sabina*, *Lactuca virosa*, some forms of *Lepidium* and *Mentha*, *Pastinaca sativa*, *Primula obconica*, *P. sinensis*, *P. cortusoides*, *P. Sieboldii*, *P. mollis*, and *P. Arendsii*, *Ranunculus acris*, *R. sceleratus*, *R. bulbosus*, and *R. Ficaria*; *Rhus Toxicodendron*, *R. venenata*, and *R. vernicifera* are very poisonous. *Ruta graveolens*, *R. divaricata*, and *R. montana*, some Sedums, *Sinapis alba*, and *Solanum Lycopersicum* may also cause irritation.—*S. E. W.*

Java, Foreign Plants Naturalized in. By C. A. Backer (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 393-420).—One hundred and fifty-three foreign plants which have become naturalized in Java are mentioned in this paper. The source of each plant, the probable method of its introduction and its distribution in Java are described.—*R. B.*

Jessamine, Yellow, The Constituents of. By Charles Watson Moore (*Jour. Chem. Soc.* vol. xcvii. Nov. 1910, pp. 2223-2233).—This is a report of research made upon the dried rhizome and roots of this well-known plant.

The authors confirmed the presence of the already previously recognized alkaloids gelsamine and gelsaminine (the former crystalline and the latter amorphous, according to the nomenclature of English literature; German investigators reverse these names), and some misconceptions as to the crystalline alkaloid have been corrected.

A third alkaloid was isolated, and found to be amorphous and very poisonous. One-tenth of a grain of the hydrochloride of the crystalline alkaloid injected into the circulation of a rabbit produced no obvious effect. One-hundredth of this quantity of the amorphous alkaloids similarly injected caused death in about twenty-five minutes.

Scopoletin, another compound found, is somewhat interesting, since it also exists in *Prunus serotina* and in jalap.—*W. A. V.*

Kalmia cuneata (*Bot. Mag.* tab. 8319).—Nat. ord. *Ericaceae*; tribe *Rhodoreae*. Carolina. Shrub, 3-4 feet high; leaves 2 inches long; flowers clustered in fascicles of 2-6 below the leaves; corolla white.—*G. H.*

Laws Relating to the Marketing and Export of Fruit, Plants, &c. By J. G. Turner (*Jour. Agr. Vict.* April 1910, pp. 193-200).—Vegetation Diseases Act, Fruit Cases Act, Commerce Act, Health Act.—The first deals with the inspection of imported fruit and plants to check the spread of disease; provision is made for a penalty of £10 against offenders in this direction; power is given to the inspectors to enter any stall, market, shop, or place and examine any trees, plants, or vegetables exposed for sale. The effects of this legislation have been shown in the immense improvement in the general quality of the locally sold fruits; this Act has been adopted by most of the States of the Commonwealth.

Fruit Cases Act secures uniformity in the size of fruit cases. Six months was allowed for getting rid of undersized cases, and for two years any sized package was allowed to be used, provided the same had the net weight legibly and durably marked thereon in letters of not less than one inch in length; this provision has now expired, and all cases used for local sale of fruit must be of the standard sizes shown in the schedules to the Act.

Commerce Act compels trade description of exports, and deals with inspecting imported seeds and plants.

Health Act allows the inspection of wharves, markets, shops, and if the fruit is over-ripe or unsound and unfit for consumption, the consignment is condemned and rejected.

Useful hints.—Pack nothing but sound produce, free from disease, damage or decay. Use new cases or bags. Stencil name and address clearly and legibly on cases. Use standard cases. Unfortunately the various States at the present time have not been able to arrange a standard for the whole Commonwealth.—*C. H. H.*

Latex, Some Remarks on the Physiological Function of the. By Ch. Bernard (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 235-276; with 4 figs.).—A long and interesting account of the literature of the subject is given, and this is followed by a description of the author's own observations. He believes that the latex plays an important part in the nutrition of the plant, and that such plastic materials as sugars, starch, fats, proteids, &c., are taken up from the latex by the tissues of the plant and used for their nutrition. Other substances which occur in the latex are most probably in the nature of excretions. Some of these excretions, however, may not be entirely useless to the plant, but they may play a secondary part in its life. The author inclines to the view that the laticiferous tissues may be organs for the storage of certain food substances which are subsequently drawn upon for the nutrition of the plant. In some cases, however, he admits that the laticiferous vessels may be important as organs for the conduction of food materials from one part of the plant to another. There is such a great diversity in the composition of the latex and in its distribution in different plants that no single function can be attributed to it in all cases. It probably has a number of

functions to perform, which vary in their relative importance from one species of plant to another.—*R. B.*

Light: Determination of the Optimum Luminosity for Plants in Different Stages of Development. By Raoul Combes (*Ann. Sc. Nat.* xi. Nos. 2, 3, 4, pp. 75-254; 42 figs., 5 plates).—This paper is illustrated with series of striking figures from photographs of plants growing under different conditions of illumination, plants accustomed to strong light, such as *Triticum vulgare*, *Mercurialis annua*, *Pisum sativum*, *Salsola Kali*, *Solanum tuberosum*, &c. With plants accustomed to strong light, such as *Amaranthus retroflexus*, the author finds a better development correlated with increased luminosity, but with plants accustomed to shade, such as *Teucrium Scorodonia*, plants become more strongly developed as the luminosity decreases. In the case of *Solanum tuberosum* the most favourable result with respect to the number of tubers and their weight was obtained from plants grown in the strongest light used.

The author establishes in his summary:—

1. Variation in the optimum luminosity during plant development.

2. That the curves of variation of the optimum luminosity differ for different physiological phenomena, such as, for instance, chlorophyll assimilation, germination, development of flowers and fruit, maturation of fruit, &c.

3. That each plant investigated, taking all the factors into consideration, possesses characteristics of its own with respect to the optimum intensity of light.—*A. S. H.*

Light: On the Adaptation of Plants to Diffuse Daylight and to Direct Sunlight. By J. Wiesner (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 47-60).—Wiesner finds that the adaptations of plants are of such a character as to enable the leaves to obtain the greatest possible amount of diffuse light, but to avoid as far as possible the greater intensities of direct sunlight. In the case of the False Acacia (*Robinia Pseudacacia*) the leaflets are spread out horizontally to diffuse daylight, but when strong direct sunlight falls upon them they move upwards upon the rachis, so that the leaflets upon one side of the rachis form a more or less narrow angle with those on the opposite side. In such a position the direct rays of sunlight no longer fall upon the surface of the leaflets.

In other plants which possess no power of movement the shape of the leaves is different according as they are exposed to direct sunlight or to diffuse light. Thus in the case of *Syringa vulgaris* Wiesner found that the outer leaves of the plant which are exposed to the direct rays of the sun are not flat, but that the leaf lamina is bent upon the midrib, so that its two lateral halves are raised up and form an angle with one another. Direct rays of sunshine are avoided by this modification. The inner and lower leaves, which are screened by the outer leaves from direct sunlight, are quite flat, and by this means obtain as much diffuse light as possible. Other adaptations are mentioned in the paper.—*R. B.*

Loganberry. By E. E. Pescott (*Jour. Agr. Vict.* Feb. 1910, pp. 79-80).—' Mammoth ' and Loganberry were raised by Judge Logan of Santa Cruz, California. The ' Mammoth ' was the result of cross-fertilizing the native American blackberry with one of the early raspberries; but the Loganberry was a chance hybrid, the result of natural cross-pollination, also between the native blackberry and one of the cultivated raspberries. Judge Logan in 1881 sowed the seeds of the native fruit for experimental purposes, with the result that one of the finest of berry fruits was produced and perpetuated. ' Phenomenal ' and ' Primus ' are hybrids produced by Luther Burbank.—*C. H. H.*

Loranthaceae, Biological Studies on. By M. Koernicke (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 665-698; 2 plates).—The author concurs with the opinion expressed by Haberlandt that many phanerogamic parasites have sprung from ancestors which carried on a purely epiphytic mode of existence. He points out several features of resemblance between the Loranthaceae and certain epiphytes. The wide distribution of the Loranthaceae in Java is indicated. They occur both in the moist western areas of the island and in the dry eastern districts; they are found close to the sea margin, and extend right to the interior of the island, and they are also to be met with round the crater of the volcano, where they are exposed to the poisonous gases exhaled.

They are found growing on all kinds of trees and bushes which do not offer mechanical difficulties to their penetration by the parasite. Bitter or astringent cell-contents, resin, or acrid latex offer no protection against the attacks of the Loranthaceae. Monocotyledons no less than dicotyledons are subject to their attacks. It is interesting to note that one member of the Loranthaceae may prey upon another member of the same family, and that one species may even grow upon another plant of the same species (*e.g. Viscum articulatum* on *Viscum articulatum*).

The Loranthaceae do not appear to be at all fastidious in their choice of a host, but there is some reason to believe that their structure and habit become to some extent modified by the host they grow upon.—*R. B.*

Mahogany Tree, A New, from Cameroon. By H. Harms (*Not. König. Bot. Berlin*, No. 47, vol. v. Nov. 1910, pp. 184-187).—A new species of *Entandrophragma*—namely, *E. Rederi*—is described in this paper. This is the second species of the genus found in the Cameroon district, the only previously known representative being *E. Candollei*. The new plant furnishes a valuable wood, very similar to that of the American Swietenias, which are the true mahogany trees.

The affinities of the new plant, with other species of *Entandrophragma* from other localities, is discussed.—*R. B.*

Maize: A New Type from China. By G. N. Collins (*U.S.A. Dep. Agr., Bull.* 161, 25 pp.; 2 plates).—An interesting description

of a new type of maize sent from Shanghai. The leaf blades are monostichous, a striking feature; and the male flowers or silks are developed in the sheath, a valuable quality in arid districts. An extremely interesting account of the history of maize in China follows. The facts used by de Candolle are reconsidered, and references are given to old Chinese literature bearing on the subject. This section is of great value to those interested in the migration of domesticated plants.—*E. A. Bd.*

Maize Smut. By T. Harvey Johnston (*Agr. Gaz. N.S.W.*, January 1910, pp. 43-44; 2 figs.).—Maize smut (*Ustilago maydis*) attacks the roots, stems, leaves, and flowers, producing whitish swellings containing fungus threads. As the spores germinate in fresh dung, fresh manure must be avoided. Horses and cattle should not be fed on smutted heads. All seed should be pickled over night in a ½ per cent. solution of copper sulphate.—*S. E. W.*

Maize: The Value of First-generation Hybrids in Corn. By G. N. Collins (*U.S.A. Dep. Agr., Bull*, 191; 40 pp. and index).—A detailed discussion of the increased vigour shown by the F^1 generation, and a recommendation of these hybrid seeds in commercial culture.

A careful *résumé* of the literature on this subject is given, as well as recent experiments with new types made by the author. An interesting feature of these is the great variability shown in many cases in F^1 generation, in certain cases "exhibiting nearly the full range of both parents."

The increased yield obtained over that of parents varies from 0 to 90 per cent.

The hybrids do not appear to require such delicate adjustment to local conditions as pure strains.—*E. A. Bd.*

Malus angustifolia (coronaria) flore-pleno. By F. Morel (*Rev. Hort.*, Feb. 1, 1910, p. 60; col. plate).—A splendid double form of Apple; expanded flowers over 2 inches in diameter, of a delicate pale, suffused lilac shade, while the half-open buds are rich rose externally. Is said to be immune from American blight. Forms a bush or tree 10 to 20 feet high; flowers in bunches.—*C. T. D.*

Mamillaria cordigera. By E. Heese (*Gartenflora*, vol. lix. pt. xx. pp. 445, 446; 1 fig.).—This cactus has a blunt oval shape, and is covered with white wool and red bristles; it is about 2½ inches in height and 2 inches in diameter. The areoles are heart-shaped.

S. E. W.

Manganese in Soil and its Effect on Grass. By F. B. Guthrie and L. Cohen (*Agr. Gaz. N.S.W.* March 1910, pp. 219-222).—It is suggested that the bare patches on a bowling-green are due to the presence of manganese in the soil. Manganese is injurious to wheat, oats, and pineapples.—*S. E. W.*

Mangrove Swamps of Malaya, Distribution and Utilization of the. By F. W. Foxworthy (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 319-344; with one map).—An account is given of the distribution of the mangrove swamps in the Malayan region. The composition of the swamps is described and it is shown that this is relatively constant, practically the same species (about thirty in number) being found in nearly every swamp. The greater part of the paper is occupied with a useful series of notes giving as briefly as possible the distribution, common names, chief uses and special characteristics of the different species making up these swamps. Some general remarks upon the utilization of the mangroves conclude the paper.—*R. B.*

Manuring Experiments, Comparative. By R. Otto-Proskau (*Gartenflora*, vol. lix. pt. i. pp. 16-18).—Equal areas of land planted with potatos were manured with ammonium sulphate, nitrolim (crude calcium cyanamide), Norwegian saltpetre—*i.e.* calcium nitrate, $Ca(No_3)_2 3H_2O$—and Chili saltpetre (sodium nitrate). The fertilizers were applied in such quantities that each of the four plots received the same weight of nitrogen—*i.e.* in the proportion of twenty-five parts by weight of ammonium sulphate, 27·7 nitrolim, 38·5 Norwegian saltpetre, and 33 of Chili saltpetre. The last two were applied as top dressings in two portions. One plot was left unmanured. Ammonium sulphate gave the best yield; the nitrolim and Norwegian saltpetre came next; then the Chili saltpetre. The unmanured plot was decidedly the worst. The largest yield of starch was obtained from the plot manured with ammonium sulphate.—*S. E. W.*

Marasmius oreades (Fries.), **On the Fairy Rings Caused by.** By J. Massart (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 583-586).—The author believes that the fairy rings produced by certain fungi in meadows are due not to the exhaustion of the nutriment in the soil (as is generally supposed), but to the excretion by the fungus of a material which is toxic to the further growth of that particular species. A fungus grows, therefore, for a year at one spot, and in doing so renders that spot poisonous for its fellows. The succeeding year the spores which have been shed by the fungus will only grow beyond the borders of the spot occupied before, and thus they will form a small circle. The following year the new generation will only develop beyond the borders of the old circle, and so on, in gradually enlarging circles, year by year.—*R. B.*

Melons, Cantelupe. By J. Troop and C. G. Woodbury (*U.S.A. Exp. Stn. Pardue, Bull.* 135, June 1909).—This is concerned with Cantelupe-growing for market in Indiana, and more especially at Decker, where the industry attains its most important proportions. The writers advocate the use of home-saved seed, but saved with more idea of selection than is at present practised. The seed fruit should be chosen not out of the heap at the packing-shed, but on the plant,

whose hardiness, vigour, and prolific bearing should also be considered. Not only appearance, but flavour, character, and thickness of flesh are of importance in selecting fruit for seed.

An ideal type of Netted Gem Melon for Indiana growers is suggested, and it is thought that by careful selection such an ideal is not impossible of attainment. The results are given of some experiments in spraying with Bordeaux mixture for rust, which was found to be both effective and commercially profitable.—*M. L. H.*

Mesembryanthemum. By G. Hegi (*Gartenflora*, vol. lix. pt. i. pp. 11-16; 1 col. plate; 2 figs.).—There are about three hundred species of *Mesembryanthemum*, most of which are natives of South Africa. *M. pubescens* is a recent introduction in Europe. It has a short, woody, branching stem, with short blunt leaves of unequal length covered with soft hairs. The calyx consists of five three-cornered oval tips, which are shorter than the purple-red corolla. *M. crystallinum* and *M. pinnatifidum* do not survive the first frosts. *M. acinaciforme* and *M. edule* (the Hottentot fig) flourish on the Mediterranean littoral.—*S. E. W.*

Mildews, Two Epidemics of, in Baden. By K. Müller (*Zeitschr. f. Pflanzenkrank.*, xix. 1909, Heft 3, p. 143.)—Reports three cases of American gooseberry mildew occurring for the first time in Baden, and also the occurrence of an outbreak of the oak mildew which has been so prevalent in Europe during the past few years and of which the perithecial stage has not yet been found, so that the identity of the mildew is still problematical.—*G. H. P.*

Mistletoe Pest in the South-west. By W. L. Bray (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 166, Feb. 1910).—There is a patch of country covering a circle of about 100 miles radius, whose centre is at Austin, in Texas, where the mistletoe has become an enemy to be fought against. Between the 96th and 97th meridians in Texas and Oklahoma lies a zone of transition from the humid climate of the Gulf States to the arid climate of the south-west. Forest growths only occur in the moist soils of river and creek bottoms, and even here they are not luxuriant. On the higher ground what few trees occur are of imperfect growth and bear evidence of a struggle against unfavourable conditions, and the problem of replacing the unsatisfactory native species with suitable trees for shade and shelter is as yet unsolved. It is just in this belt, however, that the mistletoe seems most to flourish. Whether sunlight is necessary for it, and therefore the sparse and stunted character of the existing trees makes the conditions specially suitable, or for whatever reason it may be, the plant here has become a perfect pest, infesting old and young branches alike, and even in some cases the main trunk, so that the whole tree is weakened and disfigured and finally killed.

The American mistletoe has been pronounced by botanists to differ enough from the European plant to deserve a separate name, and the

first-discovered form was called *Phoradendron flavescens*, and has become the recognized type of American mistletoe. Many other species exist in America, however, and several distinct varieties of the species named.

Picturesque details are given of the life-history of the plant and of its dissemination by birds, and suggestions are given for keeping it within reasonable limits, the sentiment which always attaches to the mistletoe and a certain demand which exists for it at Christmas being against its entire destruction.—*M. L. H.*

Mosquitos and Paraffin. By C. French (*Jour. Agr. Vict.* July 1910, p. 481).—It is only the female mosquito that stings; she lays some 400 eggs on stagnant water; the eggs hatch in warm weather in a few hours; six or seven days are spent in the larval stage, two days as pupae, making some ten days in all. It is desirable to protect the natural breeding places and destroy the larvæ. Paraffin sprayed on at the rate of 1 oz. to 15 square feet of water surface is very effective. It may be undesirable to so treat some places, especially water for domestic purposes, although this has been done without harm where the supply is drawn from the bottom of the tanks. If mosquito larvæ are noticed in still water in tanks or tubs, agitate the water by stirring; this destroys the eggs and any larvæ that are being hatched, and if done regularly will certainly check the increase of these insects; some keep their tanks free by putting in a little wheel, which is turned by a windmill, and keeps the water constantly agitated. The larvæ of the dragon-fly and of water-beetles eat enormous numbers of mosquito larvæ. Stocking the water with fish (of which the gold-fish is one of the best) is a valuable means of keeping this pest in check, as the fish destroy great numbers.

Swallows, reed warblers, fly-catchers, and other birds play an important part in destroying mosquitos in the air. Receptacles difficult of removal, such as water-tanks and barrels, should be tightly screened to prevent the female insect from reaching the water to deposit her eggs.—*C. H. H.*

Natural Revegetation of Depleted Mountain Grazing Land. By A. W. Sampson (*U.S.A. Dep. Agr., Forest Service, Circ.* 169, 1909).—Suggestions are here made for increasing the value of the grazing lands in the National Forests. Previous investigations and experiments proved that much could be done in that way, particularly by the introduction of new and valuable agricultural grasses.—*A. D. W.*

Nepenthes—Animals. I. Systematic. By J. C. H. de Meijere (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 917-940; 4 plates). —A number of animals, instead of being killed and digested by the fluid within the pitchers of Nepenthes, were found by Dr. Jensen to live and flourish under such circumstances. In this paper Professor de Meijere gives a systematic description of a number of animals found in the pitchers at Buitenzorg by Dr. Jensen.—*R. B.*

Nepenthes—Animals. II. Biological Notes. By H. Jessen (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 941-946).—In this paper it is shown that the animals which are adapted to carry on their lives in the digestive juice of Nepenthes pitchers secrete an anti-ferment which counteracts the digestive ferment of the plant, and enables them to live in its juice without suffering harm. Nine animals altogether were found living in these pitchers at Buitenzorg—three fly larvæ, four gnat larvæ, one small round worm, and one mite.—*R. B.*

Nepeta Mussinii. By E. M. Whitehead (*Garden*, Aug. 29, 1910, p. 418).—This Catmint flowers for five months of the year and neither wet nor drought affect it. It has lavender labiate flowers, and is useful as a framework to Antirrhinums or as a neutral undergrowth to beds of China Roses. Any side-shoot will strike readily, or, better still, an old plant may be divided in spring. The divisions will form bushy plants by July.—*H. R. D.*

Nephrolepis magnifica (*Gartenflora*, vol. lix. pt. xii. pp. 262-263; 1 fig.).—This lovely fern is suitable for growing in rooms.

S. E. W.

New Guinea (*Die Gart.*, July 30, 1910, p. 391).—The following plants are noted as cultivated in German New Guinea: *Ficus*, *Hevea*, *Kickxia brasiliensis*, and Cocoa, as well as *Cocos*. Peterhafen is a small island. The population is only about 200, but they are so lazy that coolies have to be brought from New Pomerania. The temperature varies between 37½° to 44° C. Both the fauna and flora are comparatively poor. A *Casuarina* is the principal forest tree. *Artocarpus integrifolia* is plentiful, but many trees are cultivated, as is the Pineapple.—*G. R.*

Nitrification, Seasonal, as Influenced by Crops and Tillage. By C. A. Jensen (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 173, April 1910; 7 diagrams).—Shows the seasonal changes in the water-soluble nitrates in summer-fallowed land, wheat land, and corn land, and the rates and extent of the seasonal removal of the nitrates by these crops.

E. A. B.

Nothofagus antarctica var. **uliginosa** (*Bot. Mag.* tab. 8314).—Nat. ord. *Cupuliferae;* tribe *Quercineae*. Temp. South America. Shrub or tree; leaves ovate, 1 inch long, crenate; male flowers solitary, female flowers sessile; fruit with a 4-valved involucre.—*G. H.*

Notylia trisepala (*Bot. Mag.* tab. 8306).—Nat. ord. *Orchidaceae*; tribe *Vandeae*. Mexico. Epiphyte, dwarf; leaves 1¾-3 inches long; scapes pendulous; flowers pale green, ¼ inch across, somewhat densely arranged.—*G. H.*

Novelties. By P. Schmidt (*Oester. Gart. Zeit.* vol. v. pt. iii. pp. 100-102).—Pfitzer, of Stuttgart, has the following novelties: Seed-

Salvia patens compacta nana, very floriferous, dark blue flowers. *Phlox* 'europa,' snow-white with silver-white eye. *P.* 'America,' salmon-pink with carmine eye. *P.* 'Asia,' lilac-pink and carmine eye. *P.* 'Africa,' carmine-purple with dark blood-red eye. New perennials: *Anemone japonica* 'Alice,' an improvement on 'Königin Charlotte,' *Papaver orientale* 'Prinzess Victoria Luise,' and *Rudbeckia* 'Goldstrahl' are useful for cutting. *Dahlia* 'Riese von Stuttgart,' with enormous blood-red blooms. Three new lilacs are 'Frau Wilhelm Pfitzer,' 'Kate Härlin,' and 'Perle von Stuttgart.' *Prunus Cerasus* 'Schnee' is a cross between *acida* and *Avium*. Worthy of notice are the derivatives of *Begonia semperflorens*—viz. improved *Erfordia grandiflora*, pink; 'Lachskönigen,' salmon; and 'Pfitzer's Triumph.' 'Rote Lubeca Würtembergia,' and 'Gracilis dunkelrot' are valuable for carpet bedding. *Salvia splendens* 'Feurball' is a splendid pot plant.—*S. E. W.*

Nymphaea Rehneltiana Henkel. By F. Henkel (*Gartenflora*, vol. lix. pt. vii. pp. 154-156; 1 fig.).—This water-lily from North Australia bears numerous lovely blue flowers, which have an odour of violets. It succeeds best in water at 68°-86° F., planted in a mixture of peat, loam, and sharp sand. Manure in the form of guano, bird-dung, or horn-shavings, should be placed some distance from the roots. The cut flowers last eight to ten days in winter.—*S. E. W.*

Onion Eel-worm. By W. Laidlaw and C. A. Price (*Jour. Agr. Vict.* March 1910, pp. 163-171).—Recommendations: (1) Destroy all affected plants; (2) Remove all weeds that might afford the worms a subsistence; (3) Removal of the first three inches of the surface soil; (4) Deep and thorough ploughing which turns the soil exactly bottom side up; (5) The promotion of a rapid growth of the plants cultivated; (6) Sowing the infested land thickly with rye, and reaping it while young; (7) Injection of carbon bisulphide into the soil, the injections to be shallow and numerous; (8) Good system of drainage.

No good is obtained by chemical insecticides, fertilizers, change of seed, or burning, and little reliance can be placed on transplanting. Good barley can be grown on diseased land, and can be followed by one, sometimes two, good crops of onions; then barley must be sown again. Soil fertility has little to do with the presence of eel-worm.

C. H. H.

Onion Fly (*Anthomyia antiqua* or *A. ceparum*). By M. Lebl (*Oester. Gart. Zeit.* vol. v. pt. iii. pp. 104-105).—The fly hatches and breeds in April. The female lays her eggs on the leaves of the plant near the ground. Sprinkling with soot is a preventive. If some plants are left unsprinkled they serve as traps for the grubs.—*S. E. W.*

Onion Growing. By J. Troop and C. G. Woodbury (*U.S.A. Exp. Stn. Purdue, Circ.* 15, May 1909, and *U.S.A. Exp. Stn. New Mexico, Bull.* 74, Jan. 1910).—The first of these contains complete

instructions for growing, harvesting, storing, and marketing onions i Northern Indiana, where hundreds of acres are annually devoted to th crop. The soil is mostly what the writers call "black muck," an the land has in most instances been reclaimed by draining the swamps This "muck" consists almost entirely of organic matter, and usuall contains 2 or 3 per cent. of nitrogen, which, however, exists in a form in which it is not available to plants, and as potassium is also gene rally deficient the soil requires suitable fertilizers to become full productive.

The second bulletin contains the results of investigations undertake at the Agricultural Experiment Station of New Mexico as to the bes fertilizer to use for Spanish onions in that district. These tests showe that sodium nitrate supplied twice at the rate of 600 lb. per acre pro duced the best results, and that the largest yields are to be had from transplanted onions, though good crops may be raised from early field planted seed.—*M. L. H.*

Orange, Sweet, A New (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi p. 15; Jan. 1910).—Dr. Trabut has addressed a note to the "Académi des Sciences" on the subject of the hybridization of the Citrus. H describes a new variety of orange named 'Clementine,' which is now to be found in many orange gardens in Algeria, and which is a hybrid between the Mandarin, *Citrus nobilis*, and *Citrus Bigaradia*. Con trary to the usual opinion, Dr. Trabut considers that the common swee orange *Citrus Aurantium* was originally produced in the same way He has observed that the *Citrus Bigaradia* does not cross with th sweet orange, but does so readily with the Mandarin, and this cross produces hybrids of varying character, of which some bear a very close resemblance to the ordinary sweet orange. On the other hand, s many of the known forms of Citrus have been produced by fortuitous crossing, that it is difficult now to tell the exact proportions of their descent from any single primitive species.—*M. L. H.*

Orchards: Protection from Frost by Smudge Pots. By H. M Dunlop (*U.S.A. Hort. Soc. Illinois, Trans.* 1909, new ser. vol. 43 pp. 117-125).—This method is beginning to be adopted in Californi and Colorado, and consists essentially of an open metal vessel con taining wood shavings saturated with crude petroleum. The oil which remains at the bottom of the pot after the shavings are consumed cause a heavy smoke, and it can be arranged that this happens at the time in the early morning when the frost is usually most severe. The prin ciple of warding off frost by a cloud of smoke is further discussed on pages 325 to 331 of the volume above quoted, sawdust being the basi of the system described there. See also abstract in the last number of the JOURNAL (p. 505) under the same head.—*A. P.*

Orchards, The Care and Management of. By Owen Thoma (*Garden*, June 29, 1910, p. 52; Feb. 12, p. 82; March 12, p. 125; an April 16, p. 188).—The writer is struck by the enormous loss of youn

trees which takes place. The agent of a large estate who during the past twenty-five years had provided 20,000 trees for planting informed him that not 7,000 of them were now living and doing well, and from other estates he had received similar reports. He considers it would be wise for proprietors of orchards attached to farms to take over the care of them during the first ten years after planting. Planting in unsuitable soil is one cause of failure. Draining must be seen to and varieties selected which will succeed in the soil of the district. In planting, the strip of land on which the trees are to be planted should be trenched and properly prepared, not a mere hole dug whether square or round. The strip should be dug to a depth of three feet and over all its length for eight feet wide, the land between the trees being cropped with potatos or vegetables for a few years, and staking must not be neglected.

Protection by galvanized wire against rabbits and stock must be afforded, the grass kept away from the roots, and the trees pruned to nine or ten buds the first winter. When pruning, the shoots from the leading branches should not be cut back at all, but shoots from the base unless wanted to fill a gap should be thinned out. The annual cultivation consists in keeping the soil clear of grass for at least 2½ feet round young trees. At the end of May a top-dressing of manure and soil may be given. With this system root pruning is not generally necessary; when it is so, the necessity shows itself when the trees are four or five years old. The trees should in such cases be taken up bodily, the roots examined, and the stronger ones cut back to two feet from the stem. The cut face should be on the upper not on the lower side, in order to induce the new roots to break upwards. The operation should be performed as soon as the leaves fall. For protection the stems should be bound with hay bands after planting. For the renovation of old and partly worn-out trees the ground should be cleared as far as their branches extend, a sprinkling of bone meal at the rate of two handfuls to the square yard scattered, and then four inches of decayed manure spread over the ground and forked in, and finally, a good soaking of water should be given. To counteract dryness at the root a ridge of soil seven or eight inches high should be formed at six or eight feet round the tree, and the basin so formed filled several times over with water. The winter is really the best time to do this.—*H. R. D.*

Orchid, New. By O. N. Witt (*Orchis*, vol. iv. pt. i. pp. 7-8).—A new hybrid obtained by crossing *Cattleya Trianiae* with *C.* × ' Enid.' The bloom resembles that of a good form of *C. Trianiae*. As secondary hybrids are very variable, other products from the same parents may exhibit wide differences.—*S. E. W.*

Orchid Plates (*Orchis*, vol. iv. No. 5).—Contains seven plates illustrating the Orchid Exhibition, but no letterpress of interest.

S. E. W.

Orchids. By U. Dammer (*Orchis*, vol. iv. pt. ii. pp. 23-25).—A specimen of *Cycnoches maculatum* flowered in January, and again in

October. The ground colour of the sepals and petals of the Januar flower was flesh-tint, while the October flower was greenish-yellow.

Epidendrum Rueckerae and *E. fragrans* may be easily confused, bu in the former the labellum is gradually prolonged to a point, while i the latter the lip ends in a sudden point.—*S. E. W.*

Orchids. By U. Dammer (*Orchis*, vol. iv. pt. iv. pp. 58-61). *Maxillaria rubrofusca*, *Octomeria decipiens* from Brazil, *Gomez recurva* from Brazil, *Cycnoches stelliferum*, and *Pleurothallis cuneifol* are described.—*S. E. W.*

Orchids. By L. Lindinger (*Orchis*, vol. iv. pt. iii. pp. 37-42 2 plates).—Examples of pseudodichotomy and pseudotrichotomy i *Cattleya* are described and illustrated.—*S. E. W.*

Orchids, Garden. By R. Schlechter (*Orchis*, vol. iv. pt. vi pp. 105-109).—*Dendrochilum Krauseanum*, a new orchid from th Battak Mountains in Sumatra, is found at an altitude of 3200 fee in a cool, moist atmosphere. It resembles *D. abbreviatum*, but differ in the structure of the labellum and the greater length of the stylidia The flowers resemble *D. latifolium*, the petals and sepals are pal brownish-yellow, and the labellum has two brown lines.

Eria Goldschmidtiana, from Formosa, bears pale yellow flowers.

Bulbophyllum birmense has smaller flowers than *B. viridiflorum* the pseudo-bulbs are bifoliate.

B. Bittnerianum, from Siam, is related to *B. Careyanum*.

B. glutinosum is described by B. Rodriguez in the second volum of his work on Brazilian orchids. The only living specimen of thi orchid in Europe is in the collection of Baron von Fürstenberg i Hugenpoet.—*S. E. W.*

Orchids, Indigenous. By Fr. Fourgons (*Jour. Soc. Nat. Hort Fr.* ser. iv. vol. xi. p. 158; Feb. 1910).—Hints are given on th cultivation of the native French orchids in the open air and in pots These include: *Ophrys muscifera, apifera, aranifera; Orchis militaris montana, bifolia, latifolia, purpurea* or *fusca, Morio; Epipactis latifolia*

M. L. H.

Parks and Arboreta. By E. Goeze (*Oester. Gart. Zeit.* vol. v pt. ii. pp. 58-63, pt. iii. pp. 93-100, pt. iv. pp. 146-152, pt. v pp. 183-188, pt. vi. pp. 225-228, pt. vii. pp. 272-274, pt. viii. pp. 307 312, pt. ix. pp. 345-351, pt. x. pp. 371-830, pt. xi. pp. 406-414).— This is a list of trees and shrubs, arranged in groups showing thei native country, and the date of their introduction into Europe.

S. E. W.

Palms, Collection of (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol xi p. 202; April 1910).—The collection of palms in the Botanical Garden at Buitenzorg (Java) is said to be the most remarkable in the world M. Wigman has just published a list of them in the "Bulletin d

Departement de l'Agriculture des Indes Neerlandaises," No. xxi. 1909, which is reprinted in this number of the *Jour. Soc. Nat. Hort.* The palms have been studied and the names verified by Professor Beccari, of Florence.—*M. L. H.*

Pandanus, The Pneumatophores of. By J. C. Schoute (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 216-220; with 1 plate and 2 text-figures).—Pneumatophores are negatively geotropic roots which bear air-pores (pneumathodes) upon them. Warburg had denied their presence in the Pandanaceae, but Schoute, like Karsten before him, finds them to occur in several species of *Pandanus*. The little pockets formed by the clasping leaf-bases and the stem of *Pandanus* are constantly filled with water or wet humus, so that the stem of this region is shut off from the surrounding atmosphere and its respiration endangered. By the production of numerous pneumatophores from this part of the stem the difficulty is met and an adequate exchange of gases ensured for the stem-tissues.—*R. B.*

Parasitism among Fungi. By E. W. Schmidt (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft. 3, p. 129).—This paper opens with a discussion of the steps or stages that have to be passed through during the process of infection of a host plant by a parasitic fungus. In the case of saprophytic fungi it has already been proved that their hyphæ are sensitive to chemical substances and exhibit the phenomenon of chemotropism. The author sets out to ascertain whether this is also true for parasitic fungi. Using a species of *Phyllosticta*, parasitic on pear leaves, he finds that the hyphæ are attracted from a substratum poor in nutritive substances towards one rich in them (plum juice), the two media being separated from each other by a celluloidin membrane. Further, he finds that the hyphæ penetrate and pass through the membrane, and in doing so they stain it, probably with some product of excretion, possibly of an enzymatic nature. In the case of the living host cell, however, the author's view is that an outward diffusion of the cell-contents, from the epidermis for example, cannot take place, and chemotropism cannot therefore come into play until the fungus, either by excretion of enzymatic or toxic substances or by purely mechanical means, has produced such changes in the epidermal cell as will result in a diffusion to the exterior of the cell-contents. The results of investigations in regard to this point are promised in a future communication.—*G. H. P.*

Patrinia triloba (*Bot. Mag.* tab. 8328).—Nat. ord. *Valerianaceae*. Japan. Herb perennial, 8-16 inches high; leaves palmately three or five-lobed; cymes three-nate, forming a panicle 5 inches across; corolla yellow, ¼ inch across.—*G. H.*

Peaches as Vinegar Stock. By H. C. Gore (*U.S.A. Dep. Agr., Bur. Chem., Circ.* 51, Feb. 1910).—In seasons of heavy crops in American peach orchards, and especially when hot weather causes the

fruit to ripen rapidly, there are available large quantities of sour over-ripe peaches which it will not pay to send to market. The ex periment has been tried of making cider of these, and afterwards pro ducing vinegar by the use of a small, quick-process generator. Th vinegar was found to be of fair quality, though turbid, and was witho any distinctive peach flavour. Sound peaches were used for the ex periments. Vinegar made from peaches which had rotted after storag is known to have a disagreeable flavour and the presence of Monil (*Sclerotinia fructigena*), though it did not affect the fermentation o the pulp, was found, among other chemical changes, to produce considerable loss of sugar in the fermented juice.

The peach juices analysed were found to be poorer in sugar an alcohol than average apple juices and richer in sucrose and acids.

Fermentation proceeded quite as rapidly without the addition of pur cultures of yeast, which were tested in some sample kegs.—*M. L. H.*

Pear-leaf Mite (*Phytopus pyri*). By G. Marunteaun (*Pom. Franç.* Sept. 1910, p. 232).—A complete cure was found for this pest by dress ing the trees in winter with

Carbolineum	500 grams
Refined petrol	1,500 ,,

This was painted over entire tree, with the result above described.

E. A. Bd.

Pears, Rotting of. By O. Bruzon (*Pom. Franç.* May 1910 pp. 130-132).—To prevent this, gather before ripe. In the neighbour hood of Lyons all pears should be gathered by September 15. In th case of pears that only become ripe in February, and yet many o which are by that time rotten, avoid growing these varieties.—*C. H. H.*

Peas, Field (*U.S.A. Exp. Stn. Wyoming, Bull.* 84, March 1910 figs., and *U.S.A. Exp. Stn. Wisconsin, Bull.* 178, July 1909; figs.).— These two bulletins are almost identical in contents. In both there ar reasons given for the larger cultivation of the field pea; its hig protein-content and its usefulness in enriching the soil are dwelt upon and instructions are given for its cultivation and harvesting.—*M. L. H.*

Peas: Mode of Inheritance of Stature and Time of Flowerin in Pisum sativum. By F. Keeble and Miss C. Pellew (*Jour. Gen.* pt. i. pp. 47-56).—The authors' investigations lead them to conclud that tallness in peas depends on the presence of two factors: long inte node and thick stem. Two semi-dwarf varieties, 'Autocrat' an 'Bountiful,' were crossed. The former has short internodes and thic stems, the latter, long internodes and thin stems. The F_2 generatio gave 114 tall plants, 33 of the 'Autocrat' type, 32 of the 'Bountiful type, and 13 dwarfs, approximating to numbers of the 9 : 3 : 3 : ratio, which occur in the offspring when two factors are involved. Th factor for late-flowering appears to be coupled with the thick-ste factor, while many more of the long-internoded, thin-stemmed plan

were early-flowering than late. It is clear, however, that further experiment is necessary to establish the apparent fact of genetic coupling in this relation, for there are many known exceptions, but these on closer investigation may resolve themselves. It would appear, however, that lateness and earliness of flowering in peas are connected in some way with the length and thickness of the internodes.—*F. J. C.*

Pelargoniums and Artificial Manures. By O. Glaser (*Gartenflora*, vol. lix. pt. x. pp. 226-228; 3 figs.).—Pot plants benefit by the careful addition of Chili saltpetre, potash, and superphosphate. Ammonium sulphate is also beneficial.—*S. E. W.*

Pelargoniums, Diseased. By L. Peters (*Gartenflora*, vol. lix. pt. x. pp. 209-213; 1 plate).—Pelargoniums are frequently attacked by the fungus *Pythium Debaryanum* with fatal results.—*S. E. W.*

Pentstemon Hartwegii (*Garden*, Jan. 1, 1910, p. 2).—This plant as figured by Lindley in 1838 in the "Botanical Register," t. 3, under the name of *P. gentianoides*, is stated to differ hardly, if at all, from the well-known variety, 'Newbury Gem.'—*H. R. D.*

Petroleum: Its Action on the Development of Plants. By F. Kryz (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 8. p. 449).—Petroleum in the form of an emulsion with water is used as an insecticide on plants without serious injury to them. The author's object was to ascertain the action of petroleum when taken in by the roots of plants. *Datura Stramonium* L. and *Alisma Plantago* L. were the plants used, and they were watered with petroleum-water mixtures of different strengths. It was found that the petroleum was taken in by the plants and deposited in unaltered condition in the various tissues. It does not act as a direct poison, but when it accumulates in the plant in sufficient quantity, the normal processes of nutrition, growth, &c., are interfered with to such an extent that the plants ultimately succumb. Introduced into the soil, petroleum causes the latter to become physically and physiologically dry, so that growth is inhibited. As further showing that petroleum is not a poison to plants, it was found that its addition to fermenting yeast did not retard the activity of the fermentation.—*G. H. P.*

Philadelphus Delavayi (*Bot. Mag.* tab. 8324).—Nat. ord. *Saxifragaceae;* tribe *Hydrangeae*. Western China. Shrub, 3-15 feet high; leaves ovate or oblong lanceolate, 3 inches long; flowers white, 1 inch across.—*G. H.*

Philodendrons. By F. Tutenberg (*Gartenflora*, vol. lix. pt. i. pp. 22-24; 2 figs.).—*Philodendron hastatum*, *P. imperiale* var. *Laucheanum*, *P. erubescens*, and *P. Warcsewiczii* are admirably adapted for growing up pillars in a winter garden.—*S. E. W.*

Phoenix canariensis at Hyères, Cultivation of and Trade in. By M. J. Fonssat (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 368;

June 1910).—An industry which has made great strides of late years Hyères is the raising of palms for export to other parts of Europe having been found that plants raised thus in the open air and re favourite at present seems to be the palm called *Phoenix canarien* under glass in the North. Among the varieties thus raised t favourite at present seems to be the palm called *Phoenix canarien* It was first noticed in the gardens of Baron Vigier at Nice, to wh it had been supplied with other seedlings by Messrs. Linden of Gan and was raised originally from seed they had imported from the Canari whence the name. This article contains much information as to t management of the plant in all its stages as grown at Hyères, a mentions that the demand for it is still larger than the supply, thou no fewer than 40,000 specimens are grown yearly at Hyères.

M. L. H.

Phosphorus in Fertilizers, Carriers of. By C. E. Thor (*U.S.A. Exp. Stn. Ohio, Circ.* 93, April 1909).—Twenty years' expe ments indicate that acid phosphate (superphosphate) has been the mo effective phosphatic manure for cereals, but that basic slag and bon meal are better in acid soils for clover. Soil acidity may be counte acted with lime, and then superphosphate is the most effective pho phatic manure.—*F. J. C.*

Phymatidium tillandsioides (*Die Gart.*, September 17, 191 p. 485).—Rarely seen in cultivation. It was first discovered in t province Parona in Brazil as an epiphyte at an altitude of 600 metre It resembles a narrow-leaved, small *Tillandsia*. The leaves are pa green and numerous; the flowers are in ten to twelve flowered raceme and white. It is of easy cultivation, grown in a shady position 14° to 18° Cel. in a small pot or pan in Sphagnum. *Phymatidiu* flowers twice every year.—*G. R.*

Pipe, Calabash, The South African. By D. Fairchild an G. N. Collins (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 41, De 1909; figs.).—Calabash pipes are made from the crooked necks of large gourd (*Lagenaria vulgaris*), which have hitherto been exclusive imported from South Africa. Considering the low price paid for th imported necks, there is no idea of any profitable industry being bu up by growing them in America, where calabash pipes are now becomin fashionable. The writers suggest merely that the plant is an attracti one in itself, and that the high price which the finished pipes fetch America is due to their pleasing variety of shape, which necessitat hand labour—always an expensive item there—in lining and finishin them. It might therefore be amusing and profitable for a man to gro and make his own pipes, which could be done in leisure moments eve by one unaccustomed to the use of tools. The processes of fittin mouthpiece and lining to bowl are fully described.—*M. L. H.*

Pittosporum Colensoi (*Bot. Mag.* tab. 8305).—Nat. ord. *Pitt sporaceae*; tribe *Pittosporeae*. New Zealand. Shrub, twigs puberulo

with long soft hairs; leaves 1¼-3 inches long; flowers solitary or in threes; corolla dark red, ¾ inch across the reflexed lobes.—*G. H.*

Plant Breeding, Methods of. By G. W. Oliver (*U.S.A. Dep. Agr., Bull.* 167; 34 pp., 15 plates).—A paper of very great value to those engaged in hybridization.

The crossing of Compositæ and the difficulties they present in emasculation led the author to try the effect of spraying the pollen-covered pistils with a small jet of water. This entirely clears away all pollen grains without in any way injuring the pistil. The emasculation of such flowers as lettuce is next door to impossible, and the author claims his method renders it unnecessary. The anthers are allowed to dehisce, and the pollen is then entirely washed off. The small water bulbs and jets as used by dentists are recommended. The manipulation of many flowers—alfalfa, dahlias, pansies, clovers, &c., &c.—is dealt with in an exhaustive manner, and is illustrated with many photographs, showing "before and after treatment." We have not seen any work which gives in a small compass so much practical advice as to the manipulations of plant breeding.—*E. A. Bd.*

Plant-Bug Pests. By W. W. Froggatt (*Agr. Gaz. N.S.W.* Feb. 1910, pp. 151-152).—Crops have suffered from attacks of the Rutherglen bug (*Nysius vinitor*), the brown ground bug (*Dictyotus plebijus*), the cherry bug (*Peltophora pedicellata*), and the bronzy-orange bug (*Stilida indecora*). The remedy is to spray with kerosene emulsion under and over the leaves. A large shallow vessel containing kerosene is held under the fruit trees, and each branch tapped with a stick wrapped with sacking. Fumigation with hydrocyanic-acid gas destroys the bronzy-orange bug.—*S. E. W.*

Plant Diseases. By T. H. Johnston (*Agr. Gaz. N.S.W.* vol. xxi. pt. vi. pp. 563-566; 2 plates).—Irish Blight in Tomatos.—The fungus *Phytophthora infestans*, which produces Irish blight in potatos, is easily communicated to tomatos, destroying their leaves and attacking the fruit. Spraying with Bordeaux mixture is recommended in the case of the potatos. All diseased tomato plants should be burnt. The packing of one infected tomato may lead to the destruction of the whole case.

Scab on Apples.—Apple scab, or "black spot," is produced by *Fusicladium dendriticum*. Spraying with Bordeaux mixture is recommended. *Coniothecium chromatosporum* attacks apples, making their skins rough and scaly. Sometimes the apples crack.—*S. E. W.*

Plant Diseases and Pests, Recent Advances in our Knowledge of (*Gartenflora*, vol. lix. pt. xvi. pp. 353-360).—*Bacillus spongiosus* attacks the bark of cherry trees, causing gumming and the sudden death of branches or of the whole tree. This fungus also attacks plums and apricots. It is spread by the pruner using an infected knife. Pruning instruments should be disinfected by immersion in a 1 per cent. solution of carbolic soap.

Roestelia cancellata produces on the bark of the savin tree brownish red cork-like excrescences; from the savin the fungus spreads to the pear, forming pustules on the leaves.

The tendency to canker in apple and pear trees may be lessened by the use of phosphate of lime. Liquid manure should be avoided.

Scab.—Apples and pears are less liable to suffer from attacks of *Fusicladium dendriticum* and *F. pirinum* if they are grown in well cultivated manured soil. The best remedy for scab is winter spraying with Bordeaux mixture. *F. cerasi* causes cherries to fall before they are ripe.

Monilia cinerea and *M. fructigena* cause black rot in cherries; they also account for the decay of the branches of cherries, plums, almonds and *Prunus triloba fl. pl.* *M. laxa* attacks apricots, and *M. Linhartiana* peaches.

American Gooseberry Mildew.—Repeated spraying with a 4 per cent. solution of potassium sulphide is recommended. American Mountain gooseberry, 'Compagnon,' 'London,' resist this fungus.

Gloeosporium ribis causes currant bushes to lose their leaves. The young leaves must be sprayed with a 2 per cent. Bordeaux mixture at the beginning of May, and twice again at intervals of a fortnight. The fallen leaves must be destroyed.

No remedy is known for the strawberry mite *Tarsonemus fragariae.*

Vines attacked by false mildew, *Peronospora viticola*, should be sprayed with Bordeaux mixture.—*S. E. W.*

Plant Diseases and Pests, Recent Advances in our Knowledge of. By Günther (*Gartenflora*, vol. lix. pt. xvii., pp. 369-373).—Finger and toe disease (*Plasmodiophora brassicae*) has destroyed from 60 to 100 per cent. of the cabbage crops in some districts in Germany. Diseased plants should be burned and the ground treated with quicklime. The use of nitrogenous manure alone is to be avoided, and an adequate supply of phosphates and potash must be ensured. Cabbage black rot, caused by *Pseudomonas campestris*, has been introduced into Bavaria from America. Burning the plants and liming the soil are advisable.

Cucumbers have been attacked by false mildew, *Peronospora cubensis.* Spraying with Bordeaux mixture is the best remedy. *Marsonia Panattoniana* causes brown spots on lettuce. The beds should be sprayed with copper sulphate solution and the young plants with ½ or 1 per cent. solution of Bordeaux mixture.

Cabbage fly (*Anthomyia brassicae*) and asparagus fly have been very destructive. Sprinkling kainit on the soil appears to check the ravages of the cabbage fly.

Savin trees act as hosts to the spores of *Gymnosporangium sabinae*; they should not be planted near pear orchards, as the fungus causes fleshy orange-coloured swellings on the under surface of the leaves of pear trees. Oak trees suffered from an epidemic of mildew, and

Japanese spindle trees were attacked by *Oidium Euonymi japonicae*. The cause of the black spot on ivy leaves has not yet been ascertained. The caterpillars of *Gracilaria syringella* have done much damage.

S. E. W.

Plant Food Removed by Rain or Dew. By J. A. Le Clerc and J. F. Breareale (*U.S.A. Dep. Agr. Year Book*, 1908; pp. 7).—Contains *résumé* of work by Wehmer, Willfarth, Römer, Wimmer, &c., and some original work. The main point brought forward is that plants exude salts on their surfaces, and therefore ash analyses are misleading, as these exuded salts are washed by rain and dew back to the soil.

E. A. Bd.

Plants, The Sleep of. By Paul Noël (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 98; Jan. 1910).—A method of retarding the flowering season of fruit trees which are liable to suffer from late frosts is here described. On March 27 a hole was made with a stick just by the roots of each tree. The hole should be the size of the stick, and 33 to 40 centimetres deep. Into this hole 200 cubic centimetres of ether, or better still of chloroform, was poured, and the hole was closed up with a sod. If necessary the operation should be renewed about April 15. It was thought at first that the retarding was due to the action of the ether on the tree itself, and the experiment was tried of inoculating the trunk with the anæsthetic or administering it to the tree in some other way. As none of these plans produced any effect, however, it was clear that the retarding of growth was due to the chilling of the ground through the rapid evaporation of the ether.

M. L. H.

Platycerium, Two Species of. By Dr. H. Christ (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 7-12; with 2 plates).—This paper deals with two species of *Platycerium*—namely, *P. sumbawense* (Christ) and *P. Ridleyi* (nov. spec.).

In 1908 Ridley described a *Platycerium* from the Malay Peninsula under the name of *P. biforme* var. *erecta*, and at about the same time Alderwerelt described a fern discovered by himself in the Lingga Islands under the name of *P. coronarium* var. *cucullatum*. These appear to be one and the same thing, and in the present paper Christ gives a photograph and full description of the plant under the title of *P. Ridleyi*.

The curious slipper-shaped and hooded fertile-frond is described, and it is pointed out that this affords protection to the sporangia both against excessive desiccation and also against the dangers which would ensue from the heavy torrential rains.—*R. B.*

Plum Pests. By A. L. Clement (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 221; April 1910).—Several insects very harmful to plum trees are described and their life-history given. These are *Hoplocampa fulvicornis* and *H. crataegi*, *Grapholita funebrana*, *Yponomeuta padella* and *Tortrix* or *Penthina pruniana*. Shaking the tree over a cloth during

the flowering season, and again soon after the formation of the young plums, is advised; the affected flowers or fruit brought down by the shaking to be immediately destroyed. Removal of infested twigs and hand-picking of cocoons, &c., is also recommended, besides applications of petroleum emulsion, Bordeaux mixture with tobacco water added, and lime-sulphur-salt wash.

Experiments are also being carried out in America in another direction. By virtue of a natural law (of equilibrium or parasitism), when a noxious species finds conditions specially suitable to its development (intensive cultivation being most apt to supply such conditions), it multiplies rapidly itself and furnishes abundant nourishment to its own natural parasites. Those in their turn multiply until they become numerous enough to check the increase of their hosts, when for lack of nourishment they partially disappear and their disappearance permits renewed increase of the noxious species. In America they are trying to make practical use of this law by the cultivation of the parasites of various insect pests, and they have already made great steps in this direction since the law was first formulated by a Frenchman (Perris), in 1866.—*M. L. H.*

Polystachya dendrobiiflora, Reichb. f. By Fr. Krânzlin (*Not. König. Bot. Berlin*, No. 47, vol. v. Nov. 1910, pp. 173, 174).—The author gives a full description of this orchid from a specimen which had been collected at Dar-es-Salam (in German East Africa) by Mr. Boxberger. The specimen was grown on in the botanical gardens at Dahlem, where it flowered. The only previous description of this species is the rather meagre one of Reichenbach.—*R. B.*

Pometia pinnata (Forst.), **Leaves with Unlimited Growth in a Bud Variation of.** By W. Magnus (*Ann. Jard. Bot. Buit.* 3rd supp. 2nd pt. 1910, pp. 807-813; 1 plate).—Witches' brooms occur upon trees of *Pometia pinnata* growing in the gardens at Buitenzorg and elsewhere. They are not due to the attack of any parasitic organism, but are instances of bud variation. The leaflets of the compound pinnate leaves are normally only slightly waved in outline and with serrated margins. The abnormal leaves are more or less deeply cleft, in typical cases right to the mid rib, and the leaf blades are very greatly reduced. The whole leaflet becomes dissected into a number of filamentous parts, which reminds one of the water-leaves of some aquatic plants. The primary segments into which the leaflet is thus divided may become further subdivided and branched. The segments continue to grow for a long time, so that the leaflet with all its segments may attain a very large size. In this manner large bushes of witch's broom may be formed from the continued growth and branching of only a few leaflets.

Leaves of other plants possessing continuous growth are mentioned in the paper (*e.g. Welwitschia mirabilis*, certain ferns, *Guarea Swartii*), and it is pointed out that *Pometia* is unique among them in the character of its growth.—*R. B.*

Potato, Blight, Irish. By A. T. Hunter (*Agr. Gaz. N.S.W.* vol. xxi. pt. vii. pp. 579-582).—The disease caused by *Phytophthora infestans* in potatos is described. It is recommended that if disease appears in a field, the young tubers should be covered with several inches of soil; spray three or four times with Bordeaux mixture. Only clean seed from disease-free districts should be planted, and the seed tubers should be carried in new bags. Soak the tubers before cutting in a solution of formalin. Neither potatos nor tomatos should be planted in the ground on which blight has appeared, for four years at least.—*S. E. W.*

Potato Blight, Prevention of. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxi. pt. vii. pp. 571-576; 6 figs.).—Spraying experiments at West Maitland with Bordeaux mixture and copper-soda mixture yielded equally favourable results.—*S. E. W.*

Potato-destroying Fungus. By T. H. Johnston (*Agr. Gaz. N.S.W.* vol. xxi., pt. viii. pp. 699-701; 1 fig. 1 plate).—The dangerous fungus *Armillaria mellea* can live as a saprophyte and as a parasite, attacking the roots of orchard and forest trees and potato tubers. A cluster of mushrooms appears around the base of the attacked tree. These yield innumerable spores, which develop into rhizomorphs pushing their way underground in search of plant tissue. This they envelop and penetrate with their slender threads. The fungus is difficult to eradicate; its growth and mode of attacking potato tubers is illustrated in the accompanying plate.—*S. E. W.*

Potato Culture in Northern Wisconsin. By E. P. Sandstein and E. J. Delwicke (*U.S.A. Exp. Stn. Wisconsin, Bull.* 177, July 1909).—A paper of advice on potato-growing and tabulated results of experiments in the treatment of the crop in Northern Wisconsin. The advantage of a suitable rotation of crops is insisted on, and also the importance of spraying with Paris green and Bordeaux mixture for insect and fungoid pests.—*M. L. H.*

Potato Culture on Irrigated Farms of the West. By E. H. Grubb (*U.S.A. Dep. Agr., Farmers' Bull.* 386, Jan. 1910).—In the mountain valleys of Colorado are found conditions of altitude, soil, and moisture naturally favourable to the growth of the potato, with an almost entire absence of harmful pests and bacterial enemies, and it should be possible to produce a crop approaching most nearly to perfection. An account is given of the most approved scientific methods of cultivation, the use of whole medium-sized seed potatos being advised. The writer lays stress upon the need for much greater care in selection of seed. Uniformity of size and shape in the yield of the parent plant should be a great consideration, and after describing what he considers a perfect specimen yield found in a crop of high general excellence, the writer declares that by a series of years of seed selection and by scientific attention to the needs of the crop, both in

food and water, such plants could be reproduced over practically whole field.—*M. L. H.*

Potato, Inheritance of Colour and Other Characters in. By R. N. Salaman, M.D. (*Jour. Gen.* i. pt. i. p. 7, Nov. 1910).—This paper forms an important contribution to our knowledge of heredity in potatos. The author has found that male sterility in the potato is strictly dominant (unlike that in the Sweet Pea, where it is recessive). No case of a plant with pale heliotrope flowers producing fertile anthers has been discovered. No connexion could be discerned between the condition of the male and female organs.

The characters of leaf shape and texture, while they segregate in the F^2 generation, appear to be closely linked together. They are, however, difficult of classification, the personal element being so weighty in these matters.

A series of crosses were made (the resulting tubers being figured), which appear to show that the long tuber is dominant over the short; thus round tubers are probably recessive. The author considers ' kidney ' potatos the most likely to vary as being heterozygous; if that be so a ' kidney ' potato may give rise to a ' round ' by a ' bud sport, and if the only factor involved is a length factor, then the round tuber ought, at least generally, to breed true to roundness.

The depth of the eye is another character which is apparently inherited on Mendelian lines. Out of 356 plants in the F^2 generation arising out of crossings between shallow-eyed and deep-eyed grand-parents, 91 were shallow-eyed, 265 deep-eyed. Apparently, therefore, shallowness of eye is a pure recessive and deepness is dominant, but the heterozygote is somewhat intermediate in this character, though most nearly deep.

The author finds that in no potato is colour altogether absent from the stem, although in some cases it is difficult to discern. To bring colour out in the tuber, however, a special factor, which he denominates D, must be present; and to produce red a further factor, R, and purple, still another, P; the purple colour not being developed unless all three factors P, R, D are present, as well, of course, as the chromogen factor (which, as just stated, appears never to be absent) C.

Solanum etuberosum of Lindsay (see vol. xxxv. pp. 53, 56) was used in some of these crosses. This, for twenty years infertile and immune from attack by *Phytophthora infestans*, lately bore fruits and was attacked by the fungus. " With the onset of sexual activity some disturbance in the mechanism by which the plant had hitherto secured immunity to *Phytophthora* had occurred." The author regards *S.* " *etuberosum* " as heterozygous in respect of immunity and finds (in 1909) some immune plants among the seedlings (7 out of 40). These plants remained immune, though fully exposed to infection in 1910. Resistance to *Phytophthora* is apparently a recessive character.

S. " *etuberosum* " is not subject to the same laws of dominance with regard to shape, eye, and colour of tuber, as the common potato, and is, therefore, probably not to be regarded as a variety of that

plant, as Wittmack has suggested, and certainly not the origin of the domestic potato, as Sutton has suggested. If it be a hybrid, as Paton thinks, then it has probably been derived from two wild species and has not *S. tuberosum* as one of its parents. It appears, from the experiments detailed, to be somewhat closely related to *S. Maglia*. The paper is illustrated by excellent plates.—*F. J. C.*

Potatos, Male Sterility in, a Dominant Mendelian Character; with Remarks on the Shape of the Pollen in Wild and Domestic Varieties. By Dr. R. N. Salaman (*Jour. Linn. Soc.* xxxix. 1910, pp. 301-312).—The author found that contabescence of the anther—a state in which the anther is more or less shrivelled up or aborted and contains no pollen—is a dominant hereditary character in the Potato. Pale heliotrope potato-flowers have always been found to be sterile, and, so far as yet investigated, heterozygous as regards sterility.

A high percentage of living pollen-grains has only been found in anthers containing abundance of pollen, but abundance of pollen in the anther does not always signify a high percentage of fertile pollen-grains.

Starting with two lines each possessing a high standard of fertility among its pollen-grains plants arise which have a tendency towards the production of sterile pollen, and in a subsequent generation these produce individuals with complete male sterility as regards "quality" of pollen.

The normal pollen-grain of both wild and domesticated potatos, when dry, is oval. Irregular grains are immature or dead grains. When water is added all the oval grains at once become circular, and are seen to be filled with a finely granular substance, while three apertures for the exit of pollen-tubes are at once obvious. The irregular grains retain their irregular shape and are seen to be empty or to contain a small bubble of air. These differences in shape were found in the wild species as well as in the cultivated, but the author has met with examples, such as the first cross between the cultivated varieties Congo and Flourball (and F^2 of the same cross), as well as several other cases, in which the pollen was quite as perfect and more abundant than in any wild type. On the other hand, the majority of the commercial potatos have but little pollen, and that little irregular and sterile. Comparative tables are given in the paper in which the pollen of cultivated and wild types are compared. From these it is seen that there is no essential difference between the two types. *Solanum tuberosum* (a wild type) possesses the most completely oval pollen-grains, but even so it is with difficulty to be differentiated, in respect of purity and shape, from the first cross between Congo and Flourball (both cultivated varieties). The wild *S. Commersonii* is not so pure to the oval type of pollen as the domestic varieties Flourball or Reading Russet.

The later in the season the more likely is the quality of the pollen to deteriorate.—*R. B.*

Potato Spraying. By A. H. Hayward (*Agr. Gaz. N.S.W.* January 1910, pp. 63, 64).—The cost of spraying two acres of potato with Bordeaux mixture, including wages and materials, amounted t 9*s*.—*S. E. W.*

Primulas, Asiatic. By R. W. (*Oester. Gart. Zeit.* vol. v pts. 1 & 2, pp. 21-24, 69-73; 2 figs.).—The following table shows th native habitat and the date of introduction into European cultivation of the Asiatic Primulas:—

P. sinensis	1820	Central China.
P. Sieboldii	1860-70	Central China.
P. cortusoides	1794	From the Western Urals to th Altai.
P. dentata	1819	Garden form of above.
P. saxatilis	1838	Amur.
P. obconica	1880	East Tibet, Hupeh, Sichuen, and Ichang in China.
P. mollis	1854	Bhutan.
P. Kaufmanniana	1874	Turkestan.
P. filipes	1882	E. Himalaya, Sikkim, Yunnan
P. Clarkei	1882	E. Himalaya, Sikkim, Yunnan.
P. vaginata	1882	E. Himalaya, Sikkim, Yunnan.
P. Listeri	1882	E. Himalaya, Sikkim, Yunnan.
P. geranüfolia	1882	E. Tibet.
P. septemloba	1885	Yunnan, Sichuen.
P. heucherifolia	1886	E. Tibet, Yunnan.
P. oreodoxa		
P. blattariformis	1887	Yunnan.
P. pycnoloba	1891	Sichuen.
P. chartacea	1895	Sichuen.
P. polyneura	1895	Sichuen.
P. cinerascens	1895	
P. neurocalyx	1895	Central China.
P. barbicalyx	1896	Yunnan.
P. Rosthornii	1899	Sichuen.
P. violodora	1902	Hupeh.
P. Paxiana	1904	Kiao Chao.
P. jesoana	1866	Japan.
P. kisoana	1866	Japan.
P. Reinii	1866	Japan.
P. tosaensis	1890	Japan.
P. Forbesii	1891	Shan States and Yunnan.
P. malacoides	1886	Yunnan.
P. androsacea	1905	
P. gemmifera	——	Kansu.
P. verticillata	1775	Beluchistan, S. Arabia, Sinai.
P. Boveana	1844	Sinai.
P. floribunda	1824-6	W. Himalaya, Afghanistan.

P. floribunda var. grandiflora	1896	
P. Lacei	——	Beluchistan.
P. petiolaris	1824	Central Himalaya to Sichuen.
P. Edgeworthii	1890-1900	Central Himalaya.
P. Hookeri	1882	Sikkim.
P. Tanneri	1886	Chumbi.
P. pellucida	1888	Yunnan.
P. moupinensis	1886	E. Tibet.
P. odontocalyx	1886	Yangtse Kiang.
P. Davidii	1886	Mupin, in Tibet.
P. ovalifolia	1886	Mupin, in Tibet, and Hupeh.
P. bullata	1885	Yunnan.
P. bracteata	1885	Yunnan.
P. Henrici	——	Lhasa.
P. megaseaefolia	1879	Rise, in Trebizond.
P. megaseaefolia var. superba	1904	
P. Partschiana	——	Mengting, in Yunnan.
P. obovata	1902	Yunnan.
P. Henryi	1902	Yunnan.

Primula Forrestii (*Bot. Mag.* tab. 8313).—Nat. ord. *Primulaceae*; tribe *Primuleae*. Western China. Perennial herb, 6 inches to 3 feet high; glandular hairy; leaves ovate-elliptic, 2 inches long; scape erect, 3-9 inches high; flowers sulphur yellow, $\frac{3}{4}$ inch across.—*G. H.*

Primula sinensis, White-flowered Varieties of. By Dr. F. Keeble and Miss C. Pellew (*Jour. Gen.* i. pt. i. p. 1, Nov. 1910).—Two kinds of white-flowered varieties of *Primula sinensis* are known: one has reddish stems, the other green. Breeding experiments suggest that the coloured-stemmed whites carry the factors for colour but that pigment formation is inhibited by the presence of a dominant white factor. Similarly, the green-stemmed whites lack the dominant white factor as well as one or more of the colour factors. The green-stemmed white variety 'Pearl' has, however, been shown to be a dominant white. The present note records some apparent exceptions to the rule of dominant white among coloured-stemmed white varieties. The grounds for considering the variety 'Snow King' a recessive white with dark-red stems are set out. 'Snow King' was also crossed with 'Snowdrift,' a white-flowered variety, and twenty-four magenta-flowered plants with reddish stems were produced in F^1.—*F. J. C.*

Pruning Fruit Trees. By J. Jaeger (*Gartenflora*, vol. lix. pt. xii. p. 269).—When pruning, carry a tube of grafting wax and apply to the wounds. After pruning a tree suffering from canker, dip the knife in spirits of wine to sterilize it before using it on a healthy tree.—*S. E. W.*

Prunings, The Burning of. By E. E. Prescott (*Jour. Agr. Vict.* July 1910, p. 479).—Prunings should not be allowed to accumulate,

nor should they be stacked in heaps in vacant parts of the orchard. The most economical method of dealing with prunings is to destroy them in a burner, which is either specially constructed by a blacksmith or which may consist of an old tank on a small truck. This is drawn around the orchard by a horse, the prunings being thrown in and destroyed as the burner is taken up and down the rows.—*C. H. H.*

Prunus Mume. By F. Henkel (*Gartenflora*, vol. lix. pt. ii. pp. 52, 53; 1 fig.).—*Prunus Mume*, a great favourite in Japan for decorative purposes, is closely related to the apricots. 'Haku-bai' bears white and 'Ko-bai' red flowers, which appear about Christmas in a cold house. The flowers have a pleasant aroma, and appear before the leaves. The fruit is round.—*S. E. W.*

Psoralea affinis (*Bot. Mag.* tab. 8331).—Nat. ord. *Leguminosae*, tribe *Galegeae*. South Africa. Shrub; leaves odd pinnate, 3-4 paired, 2 inches long; peduncles axillary, one-flowered, and clustered at the ends of branches; corolla, with a dark purple keel-tip, standard purple, nearly $\frac{3}{4}$ inch across.—*G. H.*

Pterostylis curta. By F. Ledien (*Orchis*, vol. iv. pt. vii. pp. 100-102; 1 col. plate).—The mechanism by which this Australian orchid traps insects is explained with the aid of a coloured plate.—*S. E. W.*

Pterostyrax hispidum (*Bot. May. tab.* 8329).—Nat. ord. *Styraceae*. Japan. Tree; leaves $2\frac{1}{2}$-8 inches long; elliptic panicles of racemose cymes, 4-6 inches long; corolla white, $\frac{1}{2}$ inch wide; stamens 10, exserted.—*G. H.*

Pumpkin Beetle, Banded. By W. W. Frogatt (*Agr. Gaz. N.S.W.* vol. xxi. pt. v. pp. 406, 407).—The larvæ of the banded pumpkin beetle (*Aulacophora olivieri*) are very destructive to pumpkins and melons. They have a dull white body and a dark brown head, and measure 0·4 inch in length. The soil should be dug over early in the season, and dead pumpkins and melons burnt.—*S. E. W.*

Raffia. By Von Schiller Tietz (*Gartenflora*, vol. lix. pt. xii. pp. 250-253).—Three kinds of Raffia occur in commerce. The best sort comes from the West of Madagascar; it is obtained from the upper surface of the leaves of *R. pedunculata*, and is straw-coloured. A darker variety is exported from the east coast of the island. The least valuable sort comes from West Africa; it is not nearly so strong as the other kinds.
S. E. W.

Rafflesia, On a New Species of the Genus. By H. Graf zu Solms Laubach (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part. 1910, pp. 1-6).—In the autumn of 1901 the author unexpectedly discovered some pressed specimens of a large *Rafflesia* in the herbarium at Kew. The material had been sent there in 1881 by Cantley, who was at the time curator of the botanical gardens at Singapore. The exact locality from which the plants were obtained is, however, unknown. From

indirect evidence it may perhaps be surmised that the specimens were found by Cantley in Malacca, and if that really be the case it would form an interesting extension of the known area of distribution of the larger Rafflesias. The *Rafflesia* found in the Kew herbarium appears to belong to an entirely new species, which the author names *R. Cantleyi*. Its nearest affinities are with *R. Hasseltii* (Suringar).—*R. B.*

Refrigeration of Fruit. By A. V. Stubenranch (*U.S.A. Dep. Agr. Year Book* pp. 372-374).—In the course of an article on handling fruit for market purposes the author describes the process known as pre-cooling. This consists in cooling fruit before it is placed in refrigerator-cars for transport. Considerable advantages are claimed for this method, and it is about to be largely adopted on the Pacific Coast. *E. A. Bd.*

Rehmannia Henryi (*Bot. Mag.* tab. 8302).—Nat. ord. *Scrophulariaceae;* tribe *Digitaleae*. China. A perennial herb, 6-18 inches high; leaves oblong, 3-7 inches long; flowers, single, axillary; corolla 2 inches long; mouth wide, yellow with red specks; lobes white, 2 inches from front to back.—*G. H.*

Rhenanthera Imschootiana. By E. B. Behnick (*Orchis*, vol. iv. pt. ii. pp. 27-28; 1 fig.).—This beautiful little plant is described in the "Revue de l'Horticulture Belge," 1905, p. 252, under the name of *R. matutina*, a much inferior plant.—*S. E. W.*

Rhododendron flavidum (*Bot. Mag.* tab. 8326).—Nat ord. *Ericaceae;* tribe *Rhodoreae*. Western China. Shrublet, 2 feet high, densely branched; leaves closely set, 5-10 inches long; flowers yellow, 3-5 together, 1½ inch wide.—*G. H.*

Rhododendron Harrovianum (*Bot. Mag.* tab. 8309).—Nat. ord. *Ericaceae*; tribe *Rhodoreae*. Western China. Shrub, 2-3 feet tall; leaves 1¼-3 inches long; flowers in clusters of 3-5; corolla 1 inch long, tube deep reddish-purple, limb violet-purple.—*G. H.*

Rhododendron mucronulatum (*Bot. Mag.* tab. 8304).—Nat. ord. *Ericaceae*; tribe *Rhodoreae*. Central and Eastern Asia. Dwarf shrub; leaves 1¼-3 inches long; flowers single, pale reddish-purple.—*G. H.*

Rhododendron Ungernii (*Bot. Mag.* tab. 8332).—Nat. ord. *Ericaceae*; tribe *Rhodoreae*. Caucasus. Shrub or small tree, 12-20 feet high; leaves coriaceous, 4-6 inches long; flowers pale rose, 2 inches across, in 20-30 flowered corymbs.—*G. H.*

River Decoration. By H. Pudor (*Gartenflora*, vol. lix. pt. xviii. pp. 390, 391).—The appearance of a river with low banks is greatly improved by planting alders, aspens, birches, poplars, and willows parallel to the stream. If the soil is suitable, Rhododendrons and Azaleas may be planted with good effect.—*S. E. W.*

Rose Conference, International (*Journ. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. April, pp. 254-276, and June 1910, pp. 377-416).—An international Rose Conference was held in Paris in May 1910, and a detailed report of the proceedings is given in the last paper cited. The April number published what are called preliminary memoirs, which include a long and interesting article by M. Viviand-Morel on "The Use of the Rose in the Ornamentation of the Garden" and some notes on other subjects connected with the Rose.

M. Viviand-Morel puts in a plea for the more frequent cultivation of the varieties of the *Rosa gallica*, which possesses one merit not shared by other roses, of succeeding well in a partially shaded position. Among these varieties may be mentioned *R. sublaevis*, *incomparabilis*, *arvina*, *geminata*, *tenella*, &c., and *R. austriaca*, *incarnata*, *silvatica*, *mirabilis*, &c.

For wild planting the old Provence roses have also been unduly neglected, and might well be grown in shrubberies or in the wilder portions of a garden, where they will require no care and, if grown on their own roots, can be trusted to go in search themselves of fresh feeding-ground when their own is exhausted.

Suitable roses for every possible position in the garden are described, and M. Viviand-Morel also gives a descriptive list of various forms of garden construction now in use in France which might be useful to refer to when consulting technical French works on gardening.

Boulingrin is a corruption of our *bowling-green*, and is of two sorts.

A *B. simple* is a sunk turfed space with grass banks and without ornament.

A *B. composé* is such a space planted with groups or borders of plants.

A *Gloriette* is a small garden shelter either built or formed as a "cabinet de verdure" in a park or garden.

Banquette is a hedge cut to a certain height, sometimes with growers left at intervals.

Belvedère is an eminence, or platform, from which there is a good view. It is raised on a bank of turf or surrounded by a terrace wall, and ornamented with trees and shrubs cut out into arches, through which the view appears.

Buisson is used by gardeners in a restricted sense, signifying a tree or shrub cut every two or three years so that it never grows more than three metres in height. The branches all start from the crown of the plant and grow evenly in all directions.

A *Buissonet* is a smaller *buisson*.

An *Espalier* is a tree trained against a wall by means of wires or nails.

A *Contre-espalier* is one trained in the same shape with no wall behind it. Mention is made in this memoir of the rosary of M. Gravereaux at L'Hay, near Paris. Here he will find a glorious display of all the most beautiful roses, perfectly grown and most artistically disposed.

In a note on growing roses in the difficult climate of Long Island, New York, Vice-Admiral Ward gives the following recipe for preventing mildew. The mixture should be applied every ten days from July 20 to September 1, and is said not to stain the leaves of the plant.

5 oz. carbonate of copper
3 pints ammonia
50 galls. water.

The subjects under discussion at the Conference proper were:—

1. *Synonyms.*—M. Guillot, followed by several other speakers, raised the point of the obvious inconvenience of the existence of several names for the same rose, and the Congress eventually passed three resolutions—one calling upon horticulturists in France to proceed to the formation of a good catalogue of all the known synonyms among names of roses; one in the nature of a petition to the raisers of new varieties to choose names as short and as easy for foreigners as possible; one declaring that it was in the interests of all cultivators that the horticulturists of one nation should respect the names given to the novelties of all other nations, and should not be led even into translating such names in their catalogues, still less into substituting new ones for any they find difficulty in pronouncing. Synonyms will occur, of course, even then, from incomplete information, from naming sports, &c., and some have come down to us from the early days of rose-growing.

2. *The Best Methods of Combating the Diseases of the Rose.*—These were divided into—

(A) Diseases not caused by parasites or of which the cause was uncertain.

Chlorosis.
Excrescences and necrosis.

(B) Diseases caused by vegetable parasites.

(*a*) Diseases caused by fungi or bacteria.

Phragmidium sp.
Sphaerotheca pannosa.
Botrytis cinerea.
Peronospora sparsa.
Capnodium sp.
Leaf spots (*Actinonema rosae*, *Septoria rosae*, *Pestalozzia* sp., *Cercospora rosicola*).
Rot of the roots (*Armillaria mellea*).

(*b*) Injuries caused by mosses and lichens.

(*c*) The parasitic action of mistletoe and the broomrapes.

3. *The Best Varieties of Rose Placed on the Market in* 1907.—A long list, which, if it represents only the pick of the novelties, tells well for the enterprise of the rose-growers of that year.

4. *The Delimitation of the Terms Required to Express the Scale of Height in Standard Roses.*—A subject which aroused no discussion.

5. *The Particular Influence of Magnesium in the Nourishment of Roses.*—The importance of this influence was much insisted on. It

was in fact declared indispensable for roses, always in the form o *magnesium sulphate* (one speaker pronounced *magnesium chlorate* t be poison to roses) and in doses of 200 grammes to the superficia metre. *Kainit*, which contains a proportion of 12 per cent. of mag nesium, was recommended for roses.

6. *The Use of Roses in the Ornamentation of the Garden.*—A interesting communication was also read by M. Maurice de Vilmorin on the botanical roses, giving an account of their native habitat, thei degrees of hardiness, and their value to the horticulturist, the hybrids to which each of them is parent, and advice as to the most suitable position for each in the rose garden.—*M. L. H.*

Roses, Retrospective Exhibition of (*Jour. Soc. Nat. Hort. Fr.*, Series iv. vol. xi. July 1910, pp. 468-472).—One of the most notable exhibits at the International Rose Show held at Cours-la-Reine in May 1910 was the unique collection called "The Retrospective Exhibition of the Rose," shown by M. Gravereaux, whose life's work it represents. Not content with the study of all that concerns the ways and wishes of the living rose, M. Gravereaux has followed its traces into all branches of human learning, sciences, arts, letters, and the industrial applications of these. Palæontology, geology, ethnology, language, archæology, botany, and zoology have all been laid under contribution, and as the result it seems to be matter of certainty that the first rose came from where we ourselves, our domestic animals, our cereals, and some of our garden vegetables alike had their earliest home—in the heart of the Pamirs, between the Altai and the Himalayas. This hypothesis is the more probable that it is even now upon the Central Asiatic plateau that are to be found the greatest number of species of the genus *Rosa* and its most varied forms. Starting with the scientific truth that the need will at length create the organ, M. Gravereaux has set himself to discover, by examining their characteristics, how the various species of the genus *Rosa* spread themselves over the Northern Hemisphere (there have never been any indigenous roses in the Southern Hemisphere), and he has worked out the following classification:—

1. *Roses with Imperfect Organs.*—Species considered as the most ancient. Principal characters: ovary inserted at the base of the receptacle, seeds only disseminated by artificial or accidental opening of the fruit. The group includes *R. berberifolia* (which grows in the salt regions round the Caspian and Arab Seas, and is always difficult to acclimatize), *B. microphylla*, and *R. Beggeriana*, &c.

2. *Downy or Hairy Roses.*—Scattered on the dry elevated plateaux of Asia; *R. sericea*, *R. pimpinellifolia*, *R. acicularis*, &c.

3. *Unarmed or Spineless Roses.*—Apparently contemporary with the lower tertiary upheavals: *R. alpina*, *R. cinnamomea*, &c.

4. *Prickly Roses.*—Having had, no doubt, to attach themselves to the arboreal vegetation of their epoch (tertiary), amentaceous mostly: *R. canina*, *R. oxyodon*, *R. rubiginosa*, &c.

5. *Roses with Glaucous Foliage.*—From the East of China, the North of Indo-China, the South of Formosa, and Japan: *R. laevigata*, *R. bracteata*, *R. clinophylla*, &c.

6. *Roses with Perfect Organs.*—In this section the style forms a solid column standing beyond the stamens, which permits of easy cross-fertilization. It is to be noticed that all the species of this section came from the neighbourhood of oceans or large seas: *R. moschata* (?), from the Persian Gulf and Red Sea; *R. phœnicia*, *R. sempervirens* (?), from the Mediterranean, &c.

Having thus shown the natural dispersion of the rose family, M. Gravereaux sets himself to trace the history of man's gradual acquaintance with its different species. Thus, in the Far East they had *R. canina* and *R. gallica*; in old Greece *R. centifolia* and *R. gallica;* among the Romans *R. damascena* (imported into Italy by the Phœnicians and cultivated at Pæstum), *R. alba*, *R. myriacantha* (*spinecola* of Pliny), *R. sempervirens* (*coroneola* of Pliny), *R. gallica* (the bright red form with twelve petals of Pliny), *R. Milesiana* (of the writers of the Middle Ages), *R. moschata* (the *mosceuton* of Pliny, in spite of the objections of Hardouin and of Dalechamps, which have been examined). Under the Western Empire they had the *R. sancta* and the roses imported by the Arabs—*R. lutea*, *R. punicea*, *R. moschata* (double), and a purple *gallica* called the "blue rose."

In the West, from Charlemagne to the end of the seventeenth century, were the *R. damascena*, *R. provincialis*, *R. incarnata;* then some ancient varieties, such as the York and Lancaster and the Moss Rose, which was introduced by a gentleman of Carcassonne, Fréard du Castel, and not by Mme. de Genlis, as she pretended.

M. Gravereaux then makes us see the successive introduction into Europe of the roses of the Far East, perpetual as no others have ever been; then the fortuitous crossing with the old European roses; shows us the first modern horticulturists noticing these chance obtainments, cultivating and cataloguing them, until contemporary growers, taught by observation, themselves set about creating our present principal races. To turn to the documentary part of M. Gravereaux's exhibit, the following enumeration of its principal sections will show its importance and order:—

1. "The Rose in Science."
2. "The Rose in Literature."
3. "The Rose in the Fine Arts."
4. "The Rose in Decorative Art."

That nothing might be wanting to the completeness of this wonderful museum, there was included an exhibition of the works of modern painters of the rose.—*M. L. H.*

Rose, Diseases of. By R. Laubert (*Gartenflora*, vol. lix. pts. iv. v. pp. 66-76 and 97-106; 1 col. plate).—Rust is due to the action of the fungus *Phragmidium subcorticatum*. In Silesia the climbers, such as 'Baron de Rothschild' and 'Madame Victor Verdier,'

are the greatest sufferers, while 'Gloire de Dijon,' 'Perle de Lyon,' 'Souvenir d'un Ami,' and 'Kaiserin Augusta Victoria' escape. As preventive measures, the fallen leaves should be destroyed, and in April diseased leaves and stems must be cut off and burnt, and spraying with a 1 per cent. Bordeaux mixture or copper sulphate soda wash must be carried on in winter. Basic slag, chalk, or gypsum are suitable fertilizers. Rose mildew due to *Sphaerotheca pannosa* can be checked by dusting with flowers of sulphur or spraying with potassium sulphide or calcium sulphide. The treatment should commence before there is any appearance of mildew.

Black spot (*Actinonema rosae*).—Collect and destroy diseased leaves. Spray before the buds open, and again in summer with Bordeaux mixture.

Coniothyrium, or rose-stem scorch.—This disease appears in spring in the form of round dark spots on the rind of the older branches. In the course of time the fungus penetrates into the woody part of the structure, producing a wound which looks like canker. This is a very serious pest, and all parts of the diseased trees must be burnt. The remedies suggested in the case of rust may be applied, and the plants strengthened by feeding with phosphates, lime, and potash.

Little definite is known concerning the "La France disease." It is probably due to a fungus (*Rosellinia pallida*) attacking the roots.

The blackening of rose-stalks is possibly caused by *Botrytis*.

Botrytis decay.—In damp weather rosebuds sometimes decay without opening owing to an attack of the mould *Botrytis cinerea*. Teas and climbing roses are particularly susceptible. Overcrowding must be avoided, and spraying with sodium or calcium bisulphite is recommended.

False mildew (*Peronospora sparsa*) attacks the leaves, causing irregular discoloured yellow-brown spots. Collect and destroy diseased leaves, and spray with Bordeaux mixture.

Rose canker is, in the opinion of the author, generally due to damage caused by frost.—*S. E. W.*

Rose History and Symbolism. By K. Schechner-Klosterneuburg (*Oestr. Gart. Zeit.* vol. v. pt. ix. pp. 334-340).—The damask rose was brought to Spain from Damascus in 1535, and arrived in England in 1573. In 1596 *Rosa lutea* and *R. moschata* were first cultivated in England. *R. sulphurea* was brought from Persia to England, and found its way to Italy in 1662. In 1795 *R. bracteata*, in 1789 *R. semperflorens* and *R. indica*, and in 1802 *R. multiflora* arrived from China. In 1807 the white Banksian rose first appeared in Europe, and was followed twenty years later by the yellow Banksian rose; 1810 welcomed the arrival of *R. Lawrenceana* from the Mauritius and the tea rose from China. The yellow tea rose followed fourteen years later. *R. rubifolia* was first cultivated in Europe in 1830, and *R. microphilla* in 1835.

Bulgarian attar of roses is prepared from *R. damascena* and, to a slight extent, from *R. alba*. The French oil is obtained from *R. centi-*

folia. In the neighbourhood of Leipsic large quantities of attar of roses are distilled from a mixture of *R. damascena* and *R. centifolia*. One pound of attar is obtained from 5000 to 6000 lb. of roses.

S. E. W.

Roses, Insect Pests on. By M. Schwartz (*Gartenflora*, vol. lix. pt. vii. pp. 138-148).—Damage to buds, flowers, and hips.

(*a*) The buds are eaten from the outside. This may be due to the garden chafer (*Phyllopertha horticola*) or to the larvæ of the mottled umber moth (*Hybernia defoliaria*), or winter moth (*Cheimatobia brumata*). To destroy the chafer, shake the rose-trees over a white cloth in the early morning, and destroy the beetles. The other pests may be removed by spraying with a mixture of soft soap, tobacco extract, or extract of the root of sneezewort, to which some methylated spirit has been added.

(*b*) The buds decay and dry up. This may be caused by the raspberry weevil (*Anthonomus rubi*) or by the larvæ of the gallfly (*Clinodiplopsis rosiperda*). Cut off and destroy the damaged buds. Spray with extract of sneezewort root, soft soap, paraffin, and water.

(*c*) The open flowers are eaten by the rose beetle (*Cetonia aurea*) and by earwigs (*Forficula auricularia*). Remedy, hand-picking; and, in the case of earwigs, also dust the bushes with Persian insect-powder.

(*d*) The buds are eaten by weevils (*Grapholitha roseticolana*). Cut off and burn the hips.

Cockchafers (*Melolontha vulgaris*), horse-chestnut chafers (*M. hippocastani*), the garden chafer (*Phyllopertha horticola*), the caterpillars of the vapourer moth (*Orgyia antiqua*), and the larvæ of the sawflies (*Emphytus cinctus*, *E. viennensis*, *E. rufocinctus*, *Cladius pectinicornis*, *Hylotoma rosae*, and *H. pagana*) are all troublesome. Spraying and hand-picking are the best remedies. The larva of the sawfly *Eriocampoides aethiops* eats the upper surface of the leaves.

Pale serpentine tracks in the leaves are caused by roseleaf miners (*Nepticula anomalella*, *N. centifoliella*, *N. angulifasciella*). Squeeze the leaves.

The grubs of the small moths, the *Tortrices*, known as rose maggots (*Tortrix bergmanniana*, *Grapholitha tripunctata*, *G. cynosbana*), can be destroyed by pinching the grub, but the Rose Society recommends spraying with lead arsenate in the middle of April as a preventive. The leaf-rolling sawfly (*Blennocampa pusilla*) and *Lyda inanita* must be removed by hand. The gall wasps (*Rhodites rosae*), greenfly (*Siphonophora rosae*), leaf-hoppers (*Typhlocyba rosae*), red spider (*Tetranychus telarius*), all cause damage to the leaves. Greenfly can be checked by spraying with a solution of soft soap and tobacco extract, and red spider by spraying with cold water or the mixture already referred to. The stems and branches are damaged by the larvæ of sawflies (*Ardis bipunctata*, *Monophadnus elongatus*, and *Emphytus cinctus*). The portions attacked must be cut out and burnt. Scale (*Diaspis rosae*) is removed by brushing the stem with soap solution (1 : 10) in autumn, and later spraying with lime-sulphur wash.

The larvæ of gallflies attack the new bud on budded roses. Th may be prevented by binding the part with yarn soaked in linseed o and tobacco extract.

The roots of rose-trees are attacked by the larvæ of cockchafer garden chafers, click beetles (*Elateridae*), daddy-longlegs (*Tipulidae*) and *Bibio hortulanus*. These pests may be destroyed by boring hole in the ground and pouring in carbon disulphide. The holes are the plugged to prevent the fumes escaping. The treatment must be repeate after an interval of a week.—*S. E. W.*

Roses in the Rock Garden. By R. Geschwind (*Oester. Gart Zeit.* vol. v. pt. v. pp. 161-168; pt. vi. pp. 208-216).—The autho strongly advocates the use of roses in the rock garden. For this pur pose they should be grown on their own roots, as it is difficult t remove suckers. They must be planted in deep pockets so as to hav abundant run for their roots. The hardier roses may be surrounde by dwarf-growing plants such as *Arabis*, *Aubretia*, *Campanula Aquilegia*, *Cyclamen*, *Hepatica*, *Iberis*, *Lychnis*, *Primulas*, &c.; bu roses requiring protection in winter should be associated with spring flowering bulbs, such as *Crocus*, *Scilla sibirica*, *Chionodoxa*, *Iri Xiphium* and *Xiphioides*, *Erythronium*, *Fritillaria Meleagris*, an *Galanthus*.—*S. E. W.*

Roses, New. By F. Henkel (*Gartenflora*, vol. lix. pt. viii. pp. 164 165; 1 col. plate).—'Kiautschou' is a single white rose from Kiao Chao. The flowers are pale yellow when first open, but change to pur white.

'Micrugosa,' a cross between *R. microphylla* and *R. rugosa*, has pink flowers with yellow stamens. It is fragrant, and remains in flowe a long time.—*S. E. W.*

Rusts of Cereals. By P. Sorauer (*Zeitschr. f. Pflanzenkrank* xix. 1909, Heft 4-5, p. 193).—An article of ninety-three pages, consisting of a preliminary study for an international statistical survey o cereal rusts. After the introductory pages the observations are collected together under the following six headings: (1) Occurrences illustrating the differences of intensity of rust in the same locality; (2) Examples of furthering the spread of rust by the co-operation of a variety of circumstances; (3) The decided connexion between weather conditions and the occurrence of rust; (4) Connexion between location and soil conditions and rust; (5) Influence of cultural conditions on intensity of rust; (6) Individual or race characters of cereals in relation to sensitiveness to rust. Under a seventh heading a general summary of the observations is given, the culminating idea being that the rust disease is one of "disposition" and the rust question for the future will be a problem of breeding.—*G. H. P.*

San José Scale, The, and Methods of Controlling it. By W. E. Britton (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 165, Nov. 1909; 13 figs.).—No insect has caused so much destruction as San José scale.

(*Aspidiotus perniciosus* Comst.). It was first noticed near San José, California, and described by Prof. J. H. Comstock in 1880. Its original home is probably China. It attacks not only fruit but forest and shade trees and many ornamental shrubs.

Usually the insect appears upon the bark as a grey rough coating, hardly visible to the naked eye. Gradually, as the trees become more infested, the bark may be completely covered with several layers of scales. In bad cases both the leaves and fruit are attacked.

Several species of ladybird feed on the scale insect, but are not found to be a very important check. The best methods of control are spraying the trees while dormant with lime and sulphur mixture, or with one of the soluble oils diluted at the rate of one part to fifteen parts of water, and fumigating nursery stock with hydrocyanic acid gas.—*V. G. J.*

Saxifraga Fortunei (*Die Gart.*, August 6, 1910, p. 398; fig.).—The last in flower of the Saxifrages. It is usually at its best during the latter part of October. The flowers are white, spotted with rose, and are produced in panicles. The leaves are heart-shaped, succulent, hairy.—*G. R.*

Saxifraga Grisebachii (*Bot. Mag.* tab. 8308).—Nat. ord. *Saxifragaceae*; tribe *Saxifrageae*. South-East Europe. Herb, with rosulate leaves 3-10 inches long, with paler borders and intra-marginal pits; stems erect, 4-6 inches high, with spreading leaves, reddish with an abruptly narrowed green tip; inflorescence racemose; calyx reddish-purple, hairy; petals purple.—*G. H.*

Saxifrages, Summer-flowering. By E. H. Jenkins (*Garden*, July 2, 1910, p. 325).—The value of these lies in their succession of flowering, and they embrace the most diminutive and the boldest of these plants; the latter are well planted in a fissure or crevice of the rock garden.

S. Cotyledon and its variety *S. C. pyramidalis* are the best known, and produce snowy plumes 20 to 24 inches high, but finer still is *S. C. icelandica*, reaching 3 or $3\frac{1}{2}$ feet and conspicuous in the rock garden in late June or July. Then we have *S. Hostii* and *S. Macnabiana*, which only need cultivation to develop their rosettes. *S. longifolia* often blooms and dies, offsets rarely appearing. *S. cochlearis* has erect full-flowered snowy plumes about a foot high, lasting long in good condition. In *S. lantoscana* and *S. l. superba* we have two long-leaved silvers. *S. Aizoon* is a group with many beautiful varieties, specially *balcana*, *rosea*, and *flavescens*. The crimson-spotted white Saxifrage 'Dr. Ramsey' is a gem; it is a miniature *S. longifolia*. In the July list is *S. catalanica*, from Northern Spain, beautiful if only for the silver braiding of its leaves. It is perfectly hardy, but slow growing, the flowers creamy, carried on a short spike, and the buds and stems pink, and is valuable in dry places for its conspicuous winter beauty. Other good representatives of the diminutive "gem" class are

S. caesia, *S. squarrosa*, *S. tombeanensis*, and *S. tyrolensis*; their white flowers glisten above dense silvered tufts, and the places for these are fissures and crevices.—*H. R. D.*

Scale-eating Moths. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxi. pt. ix. p. 801; 1 col. plate).—The larva of *Thalpochares coccophaga*, *T. pulvinariae*, *T. dubia*, and *T. pusilla* devour brown and white scale. *T. coccophaga* is a pretty little brown and grey moth. The tiny caterpillars, when first hatched, feed on the scale larvæ, but afterwards attack the adult scale. They cover their backs with the skins of the devoured coccids as a protection against their enemies.

S. E. W.

School Gardens. By "Mangold" (*Oester. Gart. Zeit.* vol. v. pt. v. pp. 168-171).—The school garden should have an area of 100 to 150 square yards, and should contain specimens of the ordinary indigenous trees and also fruit-trees. Other portions should be devoted to the cultivation of typical vegetables and flowers. The children of the three highest forms are to work at least one hour a week in the garden. The boys devote their time chiefly to the fruit-trees, and the girls attend to the vegetables and flowers.—*S. E. W.*

Scilla, A New (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 17; Jan. 1910).—M. A. Chabert describes a new species of *Scilla* in the "Bull. de la Soc. Bot. de France." *Scilla Kabylica* Chabert is said to be an ornamental plant worthy of cultivation. It bears six to fifteen dark blue flowers.—*M. L. H.*

Scutellaria violacea (*Bot. Mag.* tab. 8320).—Nat. ord. *Labiatae*; tribe *Stachydeae*. India and Ceylon. Herb perennial; stem 2 feet high; leaves ovate, 3 inches long, subacute; racemes terminal, 3½-6 inches long, many flowered; corolla, ¾ inch long, violet with white blotches on the lip.—*G. H.*

Sequoia gigantea. By J. Feigl-Lomnitz (*Oester. Gart. Zeit.* vol. v. pt. ii. pp. 55-56; 1 fig.).—A Sequoia, grown from seed sown in 1870, has attained a height of 15 metres in garden of the castle at Lomnitz.

S. E. W.

Shortias. By E. H. Jenkins (*Garden*, April 2, 1910, p. 164; fig.).—These form a small genus named after an American botanist, Dr. Short, containing some three species, only two of which are known to cultivators. They are untouched by the cold or the incessant changes of an English winter, and at that season assume a leaf beauty of crimson and bronze all their own.

S. galacifolia was found by Michaux in North Carolina in 1788, and rediscovered and brought into general cultivation nearly a century later. The plant grows in short compact tufts 6 to 9 inches high: the nodding white flowers appearing in March and April are in effective contrast with the coloured stalks and crimson calices. A rose-coloured form is known.

S. uniflora, the other cultivated species, comes from Northern Japan, and the finding of this plant in 1868 led to the rediscovery of the first-named species in North Carolina. *S. uniflora* is dwarfer than the first, with leaves smaller and more obtuse, and has pale pink petals crimped and veined with white. The flowers are more widely expanded and not of the nodding or hooded character of *S. galacifolia*. *S. u. grandiflora* is white suffused with pink. The Shortias respond to shelter from hot sun, and are best grown in equal parts of peat, sand, and leaf mould to which a little loam has been added. Natives of the woods, it is probable that with freer supplies of root moisture in more open positions they would succeed well and give enhanced leaf-colouring.

H. R. D.

Siderocapsa Treubii, a New and Widely Distributed Iron Bacterium. By D. Hans Molisch (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 29-34; with one plate).—This forms an interesting addition to the small group of bacteria which possess the power of oxidising the ferrous carbonate occurring in the water in which the organisms live to ferric hydroxide, which appears as a brown deposit in the mucilage sheaths or membranes of the bacteria. The brown layers covering the submerged parts of many water plants (e.g. *Elodea*, *Nymphaea*, *Salvinia*, &c.) has been often observed, but its bacterial origin has only now been demonstrated by Molisch. By means of Schiff's aldehyde reagent Molisch was enabled to render visible the bacteria lying embedded in the brown mucilage. He names this bacterium *Siderocapsa Treubii*.—*R. B.*

Silver-leaf Disease, Fruit Trees. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S. (*Woburn, Twelfth Report*, 1910, pp. 1-34).—This is an account of experiments on this disease in continuation of the results up to that date given in the Sixth Report, 1906. The authors state that the results described put it beyond doubt that it is caused by a fungus known as *Stereum purpureum*, the inoculation of a tree with a piece of the fungus nearly always producing silver-leaf, whilst neighbouring trees not thus inoculated remain quite healthy, and trees which have died, either partially or entirely, under an attack, often develop *Stereum* on the dead wood, no single instance being on record of the appearance of this fungus on a tree which has been known to have shown no signs of silver-leaf while alive (p. 2).

The fungus itself forms flat roundish disks on the bark of the dead tree, about two inches or more in diameter, of a purple or pinkish colour, though sometimes nearly white. For the purpose of inoculation it is only necessary to insert a small portion of the fungus about twice the size of a pin's head in a cut made in the bark, a week or two after which, when a tree is in active growth, there is a gradual appearance of silvering of the leaves, the whole tree possibly becoming seriously affected after four or five weeks (p. 2).

The outward manifestation of the disease is held to be due to a poison formed during the growth of the fungal threads, as the mycelium

cannot be traced in the leaves. The opinion that a tree which has been once attacked never recovers is erroneous, for, apart from the cases of recovery where the trees were not badly affected, seven cases were recorded of complete recovery where the silvering had extended to the whole of the foliage (p. 9). The disease is most common in stone fruits, laurels, and laburnums, and is occasionally met with in apples, whilst cases are recorded of the infection of a walnut, a pear, and a gooseberry bush. Experiments with *Stereum* from plums, apples, and laburnums go to show that there is no certain indication that the fungus is capable of adapting itself in any way to a particular host plant (p. 15).

The relative susceptibility of different varieties of plums has been investigated, and, though little difference was revealed in the way varieties took the disease when inoculated, there is little doubt that the Victoria is amongst those most liable to attack, and it is thought that soft-wooded varieties generally, of which this is one, would be most easily infected, owing to the ease with which their tissues suffer injury in the ordinary operations of cultivating and gathering (p. 18), infection taking place through the wood and not through the leaves.

The only remedy which has been suggested is the application of iron sulphate, and though this has found favour in New Zealand it has been found of no effect at Woburn (p. 25). The only course to adopt therefore in the present state of our knowledge is the prevention of the spread of infection. Experiments show that, so far as the pruning of silvered trees which contain no dead wood is concerned, there is no danger of infection being carried to other trees by the tools used, but when there is any dead wood on a tree the tools used should be disinfected by dipping them in paraffin, or in a solution of carbolic acid, before using them again on sound trees (p. 33). Neither is there any power of communicating the infection by anything present in the silvered leaves (p. 28) or by connexion with the roots of a diseased tree. As the fungus only fructifies on dead wood—and this soon after a tree or a branch is dead—when it may become a source of infection to dozens of other trees, the course to pursue with badly infected trees is to burn them as soon as possible (p. 32). When trees are only slightly attacked complete removal of the affected branches may be tried, cutting them off at a point considerably below that at which the silvering is in evidence (p. 33).—*A. P.*

Slugs among Strawberries (*La Pom. Franç.* March 1910, p. 68).—Moisten chaffed straw with a 4 per cent. solution of copper sulphate, dry the chaff, and place among the strawberry plants.

C. H. H.

Smuts of Sorghum (*U.S.A. Dep. Agr., Bur. Pl. Ind., Cir.* 8).—This circular deals with the two best known smuts which occur on Sorghum, *Sphacelotheca sorghi*, the grain or kernel smut, and *Sphacelotheca reiliana*, the head smut. Treatment of seed by immersion in formalin solution, or hot water at a temperature of 135° to 140° F., or with copper sulphate solutions is recommended, and proved effective with regard to *S. sorghi*. The head smut, however, which is far

less prevalent, was absolutely unaffected by the above treatment. The only remedy so far is not to use seed from infected districts, and to be careful not to use smut-infected machinery.—*D. M. C.*

Soil Bacteria. By E. Heine (*Gartenflora*, vol. lix. pt. viii. pp. 165-176; 3 figs.).—*Bacillus radicicola* and *Azotobacter* enable the plants to take up nitrogen from the atmosphere; other bacteria bring about the decay of dead animal or vegetable matter and convert the nitrogenous constituents into a form which is available for assimilation by plants—e.g. *Micrococcus ureae* sets free ammonia from urea. *Nitrosomonas* and *Nitrobacter* oxidize ammonia to nitrite and nitrate respectively. This action is encouraged by the presence of chalk in the soil. Unfortunately, the soil also contains noxious bacteria, such as *B. pyocyaneus*, which destroy the nitrates. They may be kept in check by good drainage and tillage.

Soil fatigue may be due to the fact that the roots of the plants in cultivation exude some substance which favours the growth of noxious bacteria. The remedy is to inoculate the ground or treat the seeds with culture of beneficial bacteria.—*S. E. W.*

Soil Formed, How is. By W. Sanders (*Gartenflora*, vol. lix. pt. x. pp. 216-220).—There is nothing new in this article.—*S. E. W.*

Soil, Injurious Substances in. By F. B. Guthrie (*Agr. Gaz. N.S.W.* vol. xxi. pt. v. pp. 434-441).—Infertility may be due to shallowness of surface soil, sourness, alkalinity, or to the presence of pyrites, manganese, excess of magnesia, toxic substances secreted by plants, or to organisms which destroy nitrogen-forming bacteria. Want of lime, deficiency of humus, absence of bacteria, and want of plant food also render soil infertile.—*S. E. W.*

Soils, Heat Transference in. By H. E. Patten (*U.S.A. Dep. Agr., Bur. of Soils, Bull.* 59, September 1909; figs.).—Experiments were conducted to ascertain the rate of transference of heat in various soils under varying controlled conditions. It is shown that heat is more readily transferred in a damp than in an air-dry soil, since heat passes from water to soil more readily than from air to soil; but under normal conditions "air-eddies" in the air-dry soil would be likely to cause more rapid heat-transference. The rate of transference also depends upon the quantity of water as compared with the area of the soil particles, but small soil particles may assist in making contact between the larger ones in the soil, and so assist in the transference of heat. The method of experiment and the results are fully set out.—*F. J. C.*

Soils of Nebraska, Changes in Composition of, Caused by Cultivation. By F. J. Alway (*U.S.A. Exp. Stn., Nebraska, Bull.* 111, Dec. 1909).—Analyses are given of the virgin soils of the prairies and of similar soils which have been long under cultivation. It is found that while phosphoric acid, potash, and lime have been little diminished (since they are as abundant in the subsoil as in the surface soil), organic matter and humus have been greatly diminished, especially through

erosion by wind and water. It follows that the most important things necessary for maintaining the fertility of these soils are to prevent surface erosion, especially by allowing stubble, &c., to remain, and to increase the organic matter in the soil by the addition of farmyard manure and so on.—*F. J. C.*

Soils, Quantitative Relationships of Carbon, Phosphorus, and Nitrogen in Soils. By R. Stewart (*U.S.A. Exp. Stn., Illinois, Bull.* 145, Apr. 1910).—This bulletin contains an excellent historical summary, and details a number of analyses of soils from various depths, showing that organic carbon, nitrogen, and phosphorus compounds exist in soils and subsoils of all kinds. A considerable bibliography concludes the paper.—*F. J. C.*

Sorghum, History and Distribution of. By C. R. Ball (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 175, April 1910; 16 figs.).—The introduction states that though Sorghums have been largely used as human food for over twenty-five centuries, data concerning their geographical distribution and the leading types which are found in different regions are here presented for the first time.

Contains a history, with illustrations from the principal writers, of the botanical history of Sorghum from Pliny onwards.—*E. A. B.*

Sparrows, English, How to Destroy. By N. Dearborn (*U.S.A. Dep. Agr. Farm. Bull.* 383, Jan. 1910; figs.).—The English house-sparrow, introduced into America about sixty years ago, has made itself a pest. It has increased enormously, feeds voraciously, is dirty, quarrelsome, harmful to crops, crowds out more pleasing and more useful native birds, and replaces their tuneful notes with its unmusical chatter.

This bulletin is a catalogue of methods of exterminating it or reducing its numbers.—*M. L. H.*

Spartium junceum. By G. D. (*Garden*, Aug. 20, 1910, p. 415). —The yellow Spanish Broom is useful for planting in poor soil; it blooms from July to September. If pruning is neglected it is apt to become ragged, and during the first year or two of its existence the points of the branches should be kept well shortened. Afterwards it is well to prune the bushes once a year, though clipping with shears is not to be encouraged. The plant is easily raised from seed, but as the young plants transplant badly they should be kept in pots till wanted for their permanent quarters.—*H. R. D.*

Spiraea discolor. By W. D. (*Garden*, Jan. 22, 1910, p. 40, fig.).—This Spiraea, introduced a century ago, but long neglected, is now becoming popular. It is a North American shrub growing 6 to 8 feet, or higher under favourable conditions, and forms a shapely bush of graceful outline. It is distinct from other Spiraeas, having its leaves simple, deeply serrated and pubescent beneath, and was called

by Loudon "The White Beam-tree-leaved Spiraea" on account of a fancied resemblance to *Pyrus Aria*. The flowers are cream-coloured and borne in terminal panicles in July. It grows in any ordinary garden soil, and may be increased by cuttings in summer or by seeds. It has been known as *S. ariaefolia*, and there is a dwarf variety, *S. discolor dumosa*.—*H. R. D.*

"Sports," The Production of. By G. T. Grignan (*Rev. Hort.*, Feb. 16, pp. 86-87).—A consideration of the theory that "sports" in such flowers as the Rose and Chrysanthemum are induced by propagation to an extreme extent by cuttings. Research, however, demonstrates by the very diverse evidence obtained that it is rather due to an innate tendency which asserts its potency very waywardly, and cannot so far be imputed to any definite influence. "Nature does as she pleases," and man can only profit by the chances she gives him.
C. T. D.

Spraying. By W. J. Allen and J. G. R. Bryant (*Agr. Gaz. N.S.W.* March 1910, pp. 251-255).—Spraying with fungicides should be carried on at regular intervals of about two weeks during spring and early summer. They are preventives, and must be used before the disease is prevalent. Two kinds of insecticides are used—a poison for leaf-eaters and an irritant for sucking insects such as plant lice. A nozzle of the Vermorel type is best for general use. A good pump and nozzle are essential for successful spraying.—*S. E. W.*

Spraying Fruit Trees and Bees (*Agr. Gaz. N.S.W.* March 1910, p..196).—To avoid injury to bees do not spray trees in bloom; wait till the petals have fallen.—*S. E. W.*

Spraying: Information concerning Orchard Insects. By A. L. Quaintance (*U.S.A. Dept. Agr. Year Book*, 1908; 11 pp.; 5 plates).—A discussion of spraying in general. As a winter wash the lime-sulphur mixture is strongly recommended, and is stated to destroy eggs of Psylla and the Pear-leaf blister mite, *Eriophyes pyri*. A list of chemicals used in various sprays and a discussion of their qualities is given. The plates depict various spraying outfits, most of which are known in this country.—*E. A. Bd.*

Stenoglottis longifolia. By U. Dammer (*Orchis*, vol. iv. pt. iii. pp. 43-44).—A description of the flower of *Stenoglottis longifolia* which bloomed at Dahlem in October 1909.—*S. E. W.*

Storage of Pears. By G. Marunteaun (*Pom. Franç.* pp. 5).—An important paper on certain methods adopted by the writer in storing his pears. The years most favourable to this fruit are those when rains fall during swelling of the fruit. A register of temperature (in shade) is kept, and certain varieties are found to require a longer exposure to heat than others for perfect ripening and conservation. Fruits well exposed are gathered first, *e.g.* Duchesse d'Angoulême. Fully exposed

fruits gathered September 6, half-exposed September 10, those in full shade September 16.

These fruits were kept until Christmas.

The preparation of fruits for storing is as follows:

Each fruit is dusted with a dry duster; the stem is sealed with a mixture of paraffin wax, yellow wax, and olive oil. Late varieties are wrapped in paper, which prevents shrivelling.

The temperature of store is never above 13°, though external temperature rises to 38° and falls to 30° of frost.

The walls are painted with lime-wash, in which a small quantity of formalin is dissolved.

The store is fumigated four times, when empty, with burning sulphur, and the writer states he has never had any mould on his fruits.

A table of the various degrees of temperature different varieties receive and the time they are in season is appended.—*E. A. Bd.*

Strawberries. By W. J. Allen (*Agr. Gaz. N.S.W.* April 1910, pp. 351-362; 9 figs.).—The strawberry should be planted on high land with full exposure to the sun and a good water supply Well rotted manure must be used; soot may be applied in spring at the rate of 40 bushels to the acre. In autumn equal parts of bone-meal and kainit, 3 lb. to the rod. On light soils 200 lb. of nitrate of soda to the acre should be applied during the growing season, avoiding the crowns. If the soil is deficient in lime, apply superphosphate of lime at the rate of 2 cwt. to the acre. Mulch at the time of fruiting. To check rust, spray with Bordeaux mixture when the plants begin to grow in spring and when the blossoms open. If mildew appears sprinkle sulphur over the leaves. Dust with a mixture of soot and lime to remove caterpillars. The best varieties in New South Wales are: 'Aurie,' 'Anetta,' 'Royal Sovereign,' 'Captain,' 'Noble,' 'Sunbeam,' 'Melba,' 'Cresswell's Seedling,' 'Trollope's Victoria,' 'Edith,' 'Marguerite,' 'Sir Joseph Paxton,' 'King Edward VII.,' 'Dr. Morse.'—*S. E. W.*

Strawberries, Variety Tests of. By V. M. Taylor (*U.S.A. Exp. Stn. New York, Bull.* 309, Dec. 1908; figs.).—Eighty-nine varieties of strawberry, tested during 1907 and 1908, many of them recent introductions, are described. The results given cannot, of course, be taken as an absolute test of the value of a variety in all places and under all conditions, but its strong or weak tendencies, as they appeared, are pointed out.

The bulletin ends with a series of brief cultural directions and several hints on the preparation of the ground, on fertilizers, and on the selection of varieties and of individual plants for planting.—*M. L. H.*

Sugar Beet, The Use of Bye-products of. By C. O. Townsend (*U.S.A. Dep. Agr. Year Book*, 1908, pp. 5).

Leaves.—These, on account of potash, soda, and other salts contained, are a valuable manure. For feeding, it is recommended that they be dried first; the feeding value then equals first-class hay.

Pulp.—This is used as a stock food, but not unless mixed with hay cake, &c. As a manure it has a slight value, and for paper-making it is not successful, the percentage of fibre being too low.

Waste Molasses.—Valuable as a stock food (in limited quantities), as a manure, for the manufacture of alcohol, and, it is hoped, as an ingredient in the composition of blocks for street paving.

Lime Cake.—Valuable as a fertilizer, and it is used in Germany in cement manufacture.—*E. A. Bd.*

Sugar Beet: Comparative Tests of Varieties. By J. E. W. Tracy and J. F. Reed (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 37, Sept. 1909).—Contains diagrams and tables giving the results of a series of tests as to the sugar-content of a number of varieties of sugar-beet, the seed being procured from several seed-growers both in America and in Europe, and raised at the experimental stations of the Department under conditions as uniform as possible. The standard of measurement used was the gross amount of sugar produced from an acre, as represented by the yield of roots multiplied by the sugar-content.

Tables showing the comparative yields of roots and of sugar separately are not included, but the figures are given.—*M. L. H.*

Sulphate of Iron Retarding Growth. By F. de Castella (*Jour. Agr. Vict.* September 1910, p. 598).—It has been noticed that on vines the acid sulphate of iron treatment against black spot delays the starting of the buds in spring, and its application has thus a dual effect.—*C. H. H.*

Sweet Corn, Influence of Environment on Composition of. By M. N. Straughn and C. G. Church (*U.S.A. Dep. Agr., Bur. Chem., Bull.* 127, Nov. 1909).—The sugar-content of sweet Indian corn rapidly diminishes after the ear is separated from the stalk, this diminution being more rapid, other things being equal, with a high than with a low temperature. The sugar-content of Indian corn does not seem to be highest in a low temperature as with the sugar-beet, since a higher average sugar-content was found in South Carolina and Florida than in Connecticut or Maine. On the other hand, the corn grown in the North was more tender and edible for a longer period than any grown in the South.

Of all the factors of environment which affect the edible quality of Indian corn, the amount and distribution of the rainfall appears to be the most important.

Indian corn is valuable in proportion to its succulence, tenderness, and sweetness, and these were the qualities investigated in the specimens considered. Parcels of two varieties of seed were sent to various experiment stations, principally on the Atlantic coast from Maine to Florida, and were grown in circumstances as nearly identical as local conditions allowed. Chemical analyses were made each year of the ripe corn and compared with the meteorological and other data daily collected during its growth, and the compared results are here shown by means of diagrams and tables. So many influences and circum-

stances were at work crossing each other and complicating the results that these tables are not easy to read and are sometimes misleading, but it was possible to draw the above general conclusions from them.

M. L. H.

Sweet Peas: History of Varieties. By Leon E. Renault (*Rev. Hort.*, June 1, 1910, pp. 262-265; 3 illus. of types).—An interesting account of the origin of some of the best, with cultural notes.—*C. T. D.*

Trees, Remarkable. By F. Kanngiesser (*Oester. Gart. Zeit.*, vol. v. pt. v. pp. 172-183; 4 figs.).

Abies pectinata.—In the Thuringen Forest, on the Wurzelberg, a fir tree survives which is about 470 years old. It is about 145 feet high, and 24 feet in circumference 4 feet from the ground.

Acer platanoides.— A maple in the Lautenthal, Hanover, measures 14½ feet in circumference 4½ feet above the surface of the soil, high, and nearly 29 feet in circumference 4¼ feet above the ground.

Acer Pseudoplatanus.—A sycamore at Kerns, Obwalden, is 85 feet high, and nearly 29 feet in circumference 4¼ feet above the ground.

Corylus Avellana.—In the Weser district there is a hazel 120-130 years old with a circumference of 7½ feet 4¼ feet from the ground, height about 45 feet.

Euonymus europaeus.—The largest spindle tree exists in Hanover. It is probably 200 years old, and measures 24 feet in height and 27 feet in circumference 3 feet from the ground.

Fagus silvatica.—In Westphalia there is a beech measuring 23½ feet in circumference 3 feet from the ground.

Fraxinus excelsior.—The hotel garden at Logierait, Perthshire, contains an ash 41½ feet in circumference 4 feet from the ground.

Pyrus torminalis.—The largest service tree in Germany grows near the top of the Rummelsberg. It is 65 feet high, and more than 6 feet in circumference 4 feet from the ground.

Quercus Robur.—The Wenzel oak in Bohemia is said to be about 1,007 years old. The Bound oak at the boundary of Bloxham and Bere Regis is at least 600 years old. The Körner oak near Carlsbad is 1,600 years old. Other celebrated oaks are the Killerods oak in Sweden, 700 years old; the Namiest oak, 800-1,000 years old, on the Danish island Laaland. The largest oak is probably the Newland (England), circumference 42½ feet 4 feet from the ground.

Tilia europaea.—Staffelstein, in Bavaria, possesses the largest living lime-tree; circumference 55 feet 4 feet from the ground.

Ulmus campestris.—The largest English elm grows at Schimsheim, in Hesse. It is about 49 feet high and 40 feet in circumference 4 feet from the ground.—*S. E. W.*

Tomatos, Irish Blight in. By D. McAlpine (*Jour. Agr. Vict.* Jan. 1910, pp. 48-49).—Diseased potatos and tomatos are mutually infective; diseased potatos or the spores infect healthy tomatos, and *vice versa*. Eternal vigilance is the price that the State must pay for freedom from this as well as other pests.—*C. H. H.*

Twining Plants, Observations on Tropical. By F. Czapek (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 35-46; with 2 figs.).—This paper contains two sections, the first dealing with the free coiling of the stem after the removal of its apex, and the second with some interesting cases of anisophylly of twining shoots.

The apex was removed from a number of shoots of *Ventilago*; after a few days these shoots had coiled themselves up into a number of corkscrew-like coils, and those shoots which were not previously vertically upright had now assumed that position. A number of other plants with climbing habit were found to exhibit the same phenomenon as Ventilago when the tips of the shoots were cut away. Attention is called to the fact that not only does the stem produce a number of coils after the operation, but that it also exhibits a very clearly marked negative geotropic movement.

In the second part of the paper it is pointed out that many climbing plants with opposite and decussate leaves show a very marked inequality in size between the two leaves of each pair. Moreover, in many cases this inequality of size is only apparent during the middle periods of development, whilst in earlier stages as well as in older shoots the two leaves of each pair tend to become nearly or quite equal in size. In certain cases (e.g. *Hoya carnosa*) the smaller leaf of the pair shrivels up and drops off, so that the shoots with an unmistakable opposite and decussate arrangement of their leaves at earlier stages appear to possess alternate leaves when mature.—*R. B.*

Typhonodorum Lindleyanum (*Bot. Mag.* tab. 8307).—Nat. ord. *Araceae*. Madagascar. Shrub; stem 3-10 feet high, 4-12 inches thick; leaves long-petioled, blade $1\frac{1}{4}$-$3\frac{1}{2}$ feet long, cordate or sagittate; spathe suberect, $1\frac{1}{2}$-2 feet long; tube green; blade 13-19 inches long, yellow; spadix 10-16 inches long, orange-yellow.—*G. H.*

Vegetables, Composition of. By J. Kochs (*Gartenflora*, vol. lix. pt. xxi. pp. 457-464).—The question of the influence of manure on the composition and nutritive value of vegetables requires investigation.

S. E. W.

Vegetables, Forcing. By M. Buttel (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xi. p. 64; Jan. 1910).—The two methods of forcing—by anæsthetizing the plant with ether or chloroform, and by plunging it into hot water, are here compared, and the writer seems to consider that the balance of advantage both for efficacy and economy lies with the treatment by ether.—*M. L. H.*

Velvet Bean of Florida and Related Plants. By C. V. Piper and S. M. Tracy (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 179, May 1910; plates).—The Florida velvet bean is grown as a fodder crop in Florida, the stock being turned into the fields to fatten upon it in November. It produces a large number of pods, but even in Florida requires to be sown in February. Several species and varieties have

been imported into the States and distributed, but their nomenclature was in great confusion, even the common form being wrongly described as a species of *Mucuna*. Mrs. Bort (*Bull.* 141 of the Bureau) pointed out that it was really a species of *Stizolobium* P. Browne, and the present *Bulletin* gives a key to the species of this genus, several of which bid fair to be of considerable economic importance. The characters by which the species are distinguished depend mostly upon the mature pods and seeds, which are frequently lacking in Herbaria, the habit and foliage of the different species being very much alike. Some of the species, such as *S. pruriens*, the cowitch, possess stinging hairs, and all have a substance in the sap which becomes black on exposure to air. Eight species are recognized, of which *S. cinereum* has irritating hairs; *S. hassjoo*, from Japan, where it is much grown, and which has proved very quick in reaching maturity, seed sown on April 19 in Missouri producing mature plants by September 20, while the individual plants cover a space of 3 to 4 feet square (Siebold referred to this under the name *Dolichos hassjoo*, but gave no description); *S. aterrimum*, very widely cultivated in the tropics; and *S. pachylobium* which produces clusters of pods 3 feet in length, and may be cooked and eaten, but requires a long season to mature.—*F. J. C.*

Verbena venosa. By F. Calva (*Oester. Gart. Zeit.* vol. v. pt. ii. pp. 56-59; 1 fig.).—*Verbena venosa* can readily be raised from seed with the aid of a little bottom heat. It likes a dry, sunny position, and should not be planted on freshly manured ground. It flowers till late in the autumn.—*S. E. W.*

Vinegar from Apples. By F. de Castella (*Jour. of Vict.* March 1910, pp. 151-157).—Though not quite equal to wine vinegar, is superior to much of the malt vinegar; large quantities are produced from apples in France. In the manufacture of apple, or, more correctly, cider vinegar, allowing 158 gallons of juice to the ton of apples, the yield of cider would be about 150 gallons, reduced during acetification to about 140 gallons vinegar, selling at 1*s.* per gallon = £7; cost of crushing and fermentation, say, £2 a ton.

Apple juice of 1·069 specific gravity should produce vinegar containing 8 per cent. acetic acid; after allowing for several contingencies, the amount realized by the conversion of apples into vinegar should be equal to selling them at £4 or £5 per ton.

For vinegar-making, the cider-making is continued till all the sugar is converted into alcohol, as it is only alcohol that can be transformed into vinegar.—*C. H. H.*

Vines, Sudden Dying of, in Geisenheim Vineyard. By E. Molz (*Zeitschr. f. Pflanzenkrank.* xix. 1909, Heft 2, p. 68).—Describes the death of two vines in a period of two to three days, the leaves becoming dried up from below upwards and exhibiting on their surfaces first a slimy material containing sugar and tannin, and afterwards aggregations of calcium oxalate crystals. Thyloses were very

abundant in the wood vessels. Death occurred during a very dry period following suddenly after a prolonged period of exceptionally rainy weather. The author seeks to explain the matter by supposing that during the wet period the supply of nutritive salts was a very dilute one, and that thyloses were formed to function as "suckers" to supply the wood parenchyma with salts. During this wet period transpiration was naturally diminished and the choking effect of these thyloses did not make itself felt. On the sudden return of hot weather and consequent increased transpiration, however, the vessels were unable to supply the necessary amount of water, and hence death ensued.—*G. H. P.*

Viola cornuta 'Bürgermeister' Dr. Reicke. By J. Klar (*Gartenflora*, vol. lix. pt. xii. p. 263).—This Viola has a robust, compact habit, and remains in flower a long time.—*S. E. W.*

Watering Can, New, "Jajag." By F. Calva (*Oester. Gart. Zeit.* vol. v. pt. v. pp. 188-190; 1 fig.).—To prevent the fine holes in the rose of the watering-can getting choked a conical brass-wire filter is inserted at the junction of the spout with the body of the can. It can easily be taken out and cleaned when necessary.—*S. E. W.*

Wikstroemia indica, The Number of Chromosomes of. By E. Strasburger (*Ann. Jard. Bot. Buit.* 3rd supp. 1st part, 1910, pp. 13-18; with 3 figs.).—The pollen mother-cells of *Wikstroemia* contain twenty-six chromosomes (gemini). From this one would expect to find fifty-two chromosomes in the vegetative tissues of the root, &c. This, however, is not the case, smaller numbers being always met with. Thus in two root-tips thirty and twenty-eight chromosomes were met with. From the fact that these chromosomes vary considerably in size, and also from their relative arrangement in the nucleus, Strasburger concludes that certain of the chromosomes do not separate from one another at the commencement of nuclear division, so that what appear to be single chromosomes are really composite structures consisting of two such bodies united together. In this way the author explains the fact that the number of chromosomes actually met with in these tissues appears to be smaller than would be expected on theoretical grounds.—*R. B.*

Windbreaks and Hedges. By C. B. Waldron (*U.S.A. Agr. Exp. St. North Dakota, Bull.* 88, 1910).—In order to protect farm crops, hedges, and shelter-belts of various kinds are fully described, as also the advantage to be derived from the use of them in arid and exposed situations.—*A. D. W.*

Wistaria sinensis. By E. Eipper (*Oestr. Gart. Zeit.* vol. v. pt. xi. pp. 415-416; 1 fig.).—This Wisteria should be planted in good soil containing lime, old mortar, and well-rotted cow-dung. It likes a sunny and rather moist situation.—*S. E. W.*

Woburn, Twelfth Report, 1910. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S.—This Report deals with the silver-leaf disease and the relative dates at which different varieties of apples come into flower. See notes under "Silver-Leaf" and "Apples."

A. P.

Zinnias, Induced Variation in (*Rev. Hort.*, Jan. 1, 1910. p. 7).—M. Paul Bequerel reports a curious case in which a number of Zinnias, having been injured by frost late in May, were cut down to the ground, and subsequently produced a number of shoots, which eventually flowered freely, but on abnormal lines, a double red flowering white, a white striped with red produced many red flowers. In others the flowers were abnormally formed, and in some the foliage was peculiarly twisted and arranged. It is intended to make sowings of these abnormalities to see if the variation would be constant.—*C. T. D.*

Zygopetalum maxillare. By F. Ledien (*Orchis*, vol. iv. pt. vi. pp. 84-85; 1 plate, 1 col. plate).—This orchid, from East Brazil, flourishes on the stem of a tree-fern. It requires a temperature of 54° to 59° F. in winter and a moderately moist atmosphere. One plant may bear seventy flowers of a violet-blue hue.

S. E. W.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 11, 1910.

Mr. J. GURNEY FOWLER in the Chair.

Fellows elected (59).—Major-Gen. Sir W. Adair, K.C.B., Mrs. J. Appleton, Rev. C. R. Baskett, Mrs. Belchier, Mrs. G. F. Bird, A. Boyson, Mrs. Briggs, Mrs. J. Brooks, Mrs. W. P. Carpmael, J. J. Caspell, Mrs. Champney, Miss L. D. Colles, P. S. Crowther, Mrs. Cufaude, F. G. Drew, H. F. Elton, Miss Evans, Miss M. V. Ewbank, A. W. Fell, W. R. Fernley, A.C.P., A. Forrest, H. Goude, Hon. Mrs. Grant, Mrs. Gratrix, Miss A. Harward, H. Hemsley, Mrs. H. E. Hill, C. Hutt, Dr. P. Langdon-Down, Miss C. Law, J. W. Lowe, J. W. Lowless, Mrs. McMahon, Miss G. Mansfield, G. A. Moore, Sir Walter Napier, D.C.L., N. R. Page, Miss E. M. Pattisson, T. P. Peed, C. Raindle, Capt. I. L. Riall, D.L., Miss R. Russell, R. Sankey, F. Smith, R. C. McM. Smyth, A. Spencer, M. Stather, Miss F. Symington, E. A. Tharp, Mrs. R. Thorp, Rear-Admiral Tillard, Mrs. Uniacke, Mrs. J. H. Welch, Mrs. J. G. Weller-Poley, W. Whittles, B.Sc., G. F. Williams, Dr. R. H. Wilson, Mrs. Winser, C. B. Wright, J.P.

Fellow resident abroad (1).—J. W. Crow (Canada).

Associate (1).—J. H. Melady.

GENERAL MEETING.

JANUARY 25, 1910.

The Rev. W. WILKS, M.A., in the Chair.

Fellows elected (73).—James Adams, Mrs. F. Arliss, Miss Arthur, T. Avery, J. B. Baker, Miss Barrett, Mrs. Bensinger, Mrs. E. Blount, Miss K. D. Bolitho, A. Bousfield, Mrs. F. Briggs, Mrs. J. C. Brougham, J. F. Buckle, Mrs. E. G. Buxton, Mrs. J. J. Cairnes, Mrs. Cameron, H. Chapman, J.P., Mrs. F. H. Christian, Mrs. Clay, R. Colomb, Mrs. Cundall, C. R. Dales, Mrs. G. Dawber, Capt. Hon. E. Dawson, R.N., Mrs. Doxat, Viscountess Dunluce, Miss M.

Edwards-Moss, Mrs. Evans-Lombe, Mrs. C. E. Fisher, H. J. Glenny, A. S. Goodyear, F. D. Ibbett, W. T. Joy, Mrs. B. Larkins, Miss Lewis, Miss M. Lulham, Miss C. Lycester-Penrhyn, Mrs. J. Lyster, J. B. McKenzie, Lady Macnaghten, Col. P. Mockler, C. A. Moreing, D. J. Neame, P. S. Nicolson, Miss E. K. Oswald, Major J. H. Selwyn Payne, Lady Peacock, L. Pettitt, Col. A. D. Pixley, A. Rathbone, J. Rennie, A. M. Robey, L. Rogers, E. C. Sandilands, Miss W. H. Saunders, Miss G. E. Sherris, A. C. Sim, Miss H. Skinner, Miss P. E. Smith, W. Stanbury, A. G. Stovell, Mrs. Talbot, E. Tautz, T. Turner, Mrs. Waddell, W. Wallace, Miss Warburton, J. M. Watkins, W. H. Watts, G. A. Wigram, Miss Winstone, Miss C. M. Wood, G. Yarnton.

Fellow resident abroad (1).—Erik Hjelm (Sweden).

Associate (1).—Miss F. Ewbank.

Societies affiliated (2).—Bury St. Edmunds Horticultural Society, Waikato (N.Z.) Winter Show Association.

ANNUAL GENERAL MEETING.

February 8, 1910.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (77).—C. S. Armstrong, Mrs. H. A. Baker, Mrs. F. Baker-Baker, W. D. Bason, Miss E. K. Bayley, Mrs. C. Bell, J. K. Blackmore, R. Carr, Capt. T. J. Carron-Roberts, E. W. Chaplin, Lady Chubb, A. J. Collins, C. W. Cooke, G. Crabbe, W. G. Daffarn, Miss Darbyshire, Mrs. E. Dawson, H. Denbeigh, Venble. Archdeacon Donne, Col. C. E. Duff, Mrs. R. Engledue, Mrs. Erle, H. Farrington Evans, C.S.I., Viscountess Falkland, T. Mason Good, R. Gould, W. R. Hammond, H. Hosken, A. Howard, Miss C. J. Hunter, Herbert Jones, Mrs. A. J. King, W. Lane-Claypon, J. H. Leigh, Mrs. Ley, G. K. Lyster, J. Lytle, jr., Mrs. H. M. Malden, H. Marnham, R. Marshall, Mrs. R. J. May, Mrs. F. Morgan, Mrs. R. S. Oxley, T. Pateman, W. M. Pattisson, H. Perkins, C. Pettiward, J.P., A. Pratt, W. C. Price, Hon. Mrs. Quilter, C. P. Raffill, J. Railton, C. Randall, Mrs. Max Robertson, Mrs. F. Roby, R. A. Rolfe, A.L.S., W. A. Slade, Mrs. P. Spence, W. Stillwell, Mrs. J. T. Strange, Mrs. H. Sturgiss, Mrs. Swann, Hon. Mrs. Reginald Talbot, R. W. Tootell, J. W. Towse, Lady Upcott, G. Vereker, Baroness von Ernsthausen, Alfred Want, Mrs. W. Warburton, Mrs. J. Watson, the Countess of Wharncliffe, Dr. A. H. Williams, G. Wilson, Miss M. A. Wilson, Miss E. Worssam, A. Wraight.

Associates (3).—G. Cooper, Miss H. Veister, W. Wood.

Society affiliated (1).—Tetbury Horticultural Society.

The Chairman moved the adoption of the Report, which appears below, which was seconded by Mr. J. Gurney Fowler (Treasurer) and carried unanimously.

Mr. Arthur Sutton, F.L.S., V.M.H., expressed great satisfaction with the Report, every item of which was a record of good work.

Mr. H. J. Elwes, F.R.S., F.L.S., V.M.H., agreed with every word Mr. Sutton had said, but asked for further information concerning the negotiations with the Trustees of the Lending Library.

The following names of President, Vice-Presidents, Members of Council, and Officers having been duly proposed and seconded, and the list circulated in accordance with Bye-law 74, and no alternative names having been proposed, were declared by the Chairman to be elected, viz.:

As new Members of Council.—The Rt. Hon. Lord Balfour of Burleigh, K.T., Sir Albert K. Rollit, LL.D., D.C.L., Litt.D., Mr. James Hudson, V.M.H.

As Vice-Presidents.—The Rt. Hon. Joseph Chamberlain, the Rt. Hon. the Earl of Ducie, the Rt. Hon. Lord Rothschild, Leopold de Rothschild, Esq., C.V.O., Baron Sir Henry Schröder, Bart., C.V.O., V.M.H., Sir John T. D. Llewelyn, Bart., D.L., F.L.S., V.M.H.

As Officers.—Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. (President), J. Gurney Fowler, Esq., J.P. (Treasurer), the Rev. W. Wilks, M.A. (Secretary), Mr. Alfred C. Harper (Auditor).

The Victoria Medal of Honour was presented to Messrs. J. H. Goodacre, W. Botting Hemsley, F.R.S., and A. MacKellar.

Messrs. H. J. Chapman, J. McIndoe, and W. H. White were presented with the Veitch Memorial Medal.

The President reported the gift to the Society of a portrait of Mr. Harry J. Veitch, V.M.H.

Mr. C. T. Druery, V.M.H., proposed a vote of thanks to the Chairman, which was seconded by Mr. W. Marshall, V.M.H., and carried unanimously.

REPORT OF THE COUNCIL

FOR THE YEAR 1909.

1. **The One Hundred and Sixth Year.**—The past year, though climatically unfavourable for Horticulture, has, nevertheless, been a satisfactory one of progress in almost every branch of the Society's work.

2. **Wisley Gardens.**—The very heavy rainfall and continual damp, coupled with lack of sunshine, has had the same effect on the Society's Gardens as on most other gardens in the south-east of England. The unfortunate effects have been felt especially in the Trials, for which normal conditions are so particularly desirable for obtaining reliable results and records. Steady work has, however, been maintained, and many improvements effected. A new Fruit wall, some 100 feet long, has been added, enabling the Students to obtain instruction in the training of fruit trees on walls. A complete and commodious potting and working shed has also been built. The public path crossing the

lower meadow has been fenced, in order to protect the newly planted trees and shrubs from damage.

A large and valuable gift of Orchids received from J. B. Field, Esq., together with others from the Hon. Mrs. Henry Gladstone, Colonel Rippon, Mrs. Davies Evans, and our Treasurer, have emphasized the necessity for a new Orchid house, which it is hoped may be built during the coming year.

The value of the Research and Experimental work carried on in our laboratory at Wisley can hardly be over-estimated. The School of Horticulture is also making most satisfactory progress. The results of the 1909 Examinations have been highly encouraging, Diplomas having been gained by eight out of the nine Students who left at the end of the summer, as follows:—

Diploma Examination (in order of merit):—

A. Simmonds (Diploma and Demonstratorship of £40 for one year), W. G. Kent (Diploma and Prize), J. Ridley (Diploma and Prize), H. W. Abbiss (Diploma and Prize), G. A. S. Brooks (Diploma), S. B. Gorringe (Diploma), H. L. Robson (Diploma), N. A. Phillips (Diploma).

Nicholson Prize for Observation:—

A. Simmonds.

General Examination:—

J. W. McCaig (Scholarship, £25 a year for two years, Silver-gilt Medal, Certificate, and Prize), W. Miles (Certificate and Prize), W. G. Kent (Certificate and Prize), H. L. Robson (Certificate and Prize), A. Simmonds (Certificate and Prize). Certificates were also awarded to twelve other Students.

These Awards were distributed on October 6 by Harry James Veitch, Esq., V.M.H., who was accompanied by other Members of the Council, together with the Right Hon. Arthur C. Dyke-Acland, ex-Minister of Education, who gave a short address. Mr. James Hudson, V.M.H., also gave advice arising from a lifelong experience as a practical and scientific gardener.

It was not a little gratifying to find a Wisley Student, Mr. McCaig, placed first in the General Examination, of 291 Candidates from all parts of the Empire, thereby becoming entitled to the two years' Scholarship of £25 a year offered by the Society and the Worshipful Company of Gardeners alternately. For the second year in succession this distinction has been won by a Student of the Society.

The prize of £5 given by Mr. Hudson, V.M.H., as a memento of his having passed the Society's Examination in Horticulture just 40 years ago, deserves a very pleasant acknowledgment. The amount was devoted to prizes awarded to those students who have successfully passed the Society's General Examination.

In 1910 Diplomas are again offered by the Council for the Students, the following prizes being also available for award, viz.: Mr. Arthur

Sutton's Prize of £3 10s., to be divided amongst the Students at the discretion of the Council; and the Nicholson Prize of £2 2s. a year, given to the Student who shows the greatest power of practical observation on the fauna and flora of the Garden and District. A Prize of £5 has also been offered by Mrs. G. F. Wilson for the Student producing the best collections of dried plants and insects, for which the Council sincerely thank her.

3. **Innes' Charity.**—An order has been made by the Charity Commission respecting the Charities of John Innes, in the parish of Merton, Surrey. The Charity provides for the foundation of a Horticultural Institution at Merton for the promotion of Horticultural instruction, experiment, and research. The Order institutes a Council of 12 Representative Members, nominated partly by other kindred institutions. The Council of the Royal Horticultural Society obtained the permission of Sir Daniel Morris, K.C.M.G., V.M.H., to nominate him as their representative, and are glad to find that he has at once been appointed Vice-Chairman of the Council of the new Institution. Professor Bateson, F.R.S., V.M.H., has been elected Director.

4. **Portraits.**—(1) Baron Schröder.—It is a matter of great satisfaction to the Council to have at last secured a full length portrait of Baron Schröder, to whom the Society has been, and still is, so greatly indebted, and who in our Centennial Report was justly named "The Father of the Hall," for the existence of our present magnificent building is due to Baron Schröder more than to any other single individual. A splendid portrait of this benefactor (after Herkomer) now hangs in the Council Chamber.

(2) Sir Thomas Hanbury, K.C.V.O., V.M.H.—Another long wished for portrait is also shortly to be hung, viz. that of the late Sir Thomas Hanbury, K.C.V.O., V.M.H., the donor of the Wisley Garden. The original artist of a portrait of which Sir Thomas thought very highly, and which now hangs in his famous residence at La Mortola, in Italy, is making a copy, which, on completion, will occupy a place in the Council Chamber in company with the portraits of Baron Schröder and Sir Trevor Lawrence, Bart., our President.

(3) Information has also been received that a portrait of Mr. Harry Veitch, V.M.H., by Hugh Rivière, subscribed for by his friends, is about to be presented to the Society.

Perpetual memorials will thus be brought within the Council Room of some of the most notable of those who have played a foremost part in bringing the Society to its present prosperity and usefulness—men whose memories will always be revered by those who follow after.

5. **Darwin Centenary.**—The centenary of the birth of Charles Darwin and the jubilee of the issue of his work, "The Origin of Species," was celebrated last June at his old University of Cambridge, and it was most fitting that the Society's Botanist, Professor Geo. Henslow, M.A., V.M.H., whose father was a friend and confidant of

this great scientist, should have been selected to represent the Society at the celebration ceremonies. He was the bearer of an address from the Council, the terms of which will be found in the Journal of the Society (vol. xxxv. part ii. p. 227).

6. **Jubilee of the Fruit and Floral Committees.**—The Council congratulate the Fruit and Floral Committees on the celebration of their jubilee, an occasion which it was thought fitting to mark by a dinner given to the members at the Hôtel Windsor, Victoria Street, on July 6. It is a matter of no little pleasure to note the long uninterrupted service of many of the members of both Committees, and the Council, on behalf of the Fellows, again extend to them their warmest thanks for the service they render to the Society, and the invaluable assistance so freely and generously given through so long a series of years. The Council were glad to hear that the Fruit Committee had taken advantage of the occasion to present their Chairman with his portrait.

7. **Entertainment of Germans.**—It was with much pleasure that the President and Council entertained at luncheon at the Holland House Show a party of 90 members of the German Society for Garden Art, who were then in London visiting English gardens. The visitors were under the guidance of Herr Fritz Enke, with Herr Beiz, the Secretary, and Herr Späth (the son of the renowned German Arboriculturist), as interpreter. Our guests expressed themselves more than pleased with the magnificence of the show and the high excellence of gardening generally in England, and it is hoped they all carried home a pleasurable remembrance of their entertainment at the hands of their British fellow-gardeners.

8. **The Lawrence Medal.**—It will be remembered that three years ago a subscription fund was formed to secure a portrait of our President and for the founding of a Medal in his honour. The choice of an artist for executing the medal led to some delay, but eventually the work was entrusted to Mr. Bertram Mackennal, A.R.A., who has worked out an excellent design. The first medal struck was rightly given to our President, whose name it bears. The 1909 medal has been awarded to Lieut.-Colonel G. L. Holford, C.I.E., C.V.O., in recognition of the beautiful exhibits of Orchids which he has made during the past year.

9. **Deputations.**—It was with much pleasure that the Council sent Deputations to the following Shows in response to invitations received, viz.: Berlin International, Birmingham, Gloucester, and Cardiff, in each case being most hospitably and agreeably entertained by the organizing bodies.

The Council have accepted an invitation from the General Bulb Growers' Society at Haarlem to attend their Jubilee Show next spring, and have promised to send a deputation to visit a Hardy Fruit Show to be held at Hexham in the late autumn.

10. **Royal Agricultural Society.**—The Council are arranging to co-operate with the Royal Agricultural Society in the promotion of a great Horticultural Show at Liverpool in June next, in connection with the R.A.S. Annual Show. Fellows are requested to give all assistance in their power.

11. **Library.**—During the year an opportunity occurred of acquiring a valuable collection of rare old Horticultural and Botanical Books which had been got together by one of the Fellows of the Society—an opportunity which the Council were only too glad to embrace.

Negotiations are pending with the Trustees with the object of uniting the Lindley Library more indissolubly with the Society. Legal difficulties stand in the way, but there is every hope that the year 1910 will see them overcome, and the union between the Lindley Library and the Society placed on a thoroughly satisfactory basis.

12. **Spring Bulb Show.**—The Spring Bulb Show on March 9 proved one of the most popular events of the Society's year. The attendance was so large that the Council consider it advisable, in repeating the Show in 1910, to make it of two days' duration, the dates fixed being March 8 and 9.

13. **Temple and Holland House Shows.**—The twenty-second Temple Show was a great success, though the continuous rain deprived visitors of much of its usual pleasure. The Benchers—for reasons fully recognized—were compelled to make many restrictions upon the Society during the days of its occupation of the gardens, but it is understood that they were amply satisfied with the manifest desire of the Society to conduct the show with as little disturbance to the quietude of the garden as possible.

The Holland House Show, in spite of unfavourable weather, has not been surpassed by any previously held by the Society.

The Council extend their hearty thanks to the Treasurer and Benchers of the Inner Temple; and to Mary, Countess of Ilchester, for granting the Society privileges, which, we are glad to say, have again been extended for the year 1910.

14. **Affiliated Societies' Challenge Cup.**—This Cup, competed for by exhibits of apples and pears from our Affiliated Societies, and collected from amongst their members, created very great interest, and was won by the Royal Jersey Society, thirteen separate collections having been staged.

The Cup can be won by the same Society only once in four years, but the winning Society in any year is not precluded from competing for any other prizes that may be offered in this competition. The date fixed for 1910 is October 13 and 14.

15. **Colonial Fruit Show.**—A highly successful Show of Colonial-grown Fruit was opened on December 1, and gave much satis-

faction. The success of the Show this year was to no small extent due to the warm interest which her Royal Highness the Princess Louise, Duchess of Argyll, took in the Exhibition, and by herself attending to declare it "open." The Princess was accompanied by the Duke of Argyll, K.T., G.C.M.G., G.C.V.O., who spoke appreciatively of the exhibits at the opening ceremony. The large attendance of visitors on each day indicated the growing interest of Fellows in this effort of the Society.

The Trade Commissioner for the Dominion of Canada in a recent lecture before the Royal Colonial Institute, speaking of one of the Society's previous Colonial shows, said: "At the Show held by that most liberal and beneficent of organizations, the Royal Horticultural Society, Nova Scotia was represented, and shortly afterwards consignments were sent to London."

The following extract from a letter recently received from South Africa also testifies to the good work done by the R.H.S. Colonial Shows: "I trace to your institution of Colonial Shows the beginning of our export trade in Citrus fruits, which in time will, I think, become of the utmost importance to South Africa."

16. **Presents.**—The Council acknowledge and tender their thanks for several gifts which have reached them during the year. Among these may be mentioned a marble bust of Sir Joseph Paxton, presented by Lord Brassey; a valuable microscope for Wisley, from Mr. C. G. A. Nix; some of Mr. Luther Burbank's recent introductions, from Mrs. Rotch; a large collection of orchids, from Mr. J. A. Field; and a valuable consignment of *Vanda coerulea*, from Colonel Rippon. Gifts of lantern slides are also acknowledged from the Rev. J. B. Hall and Mr. Arnett, of Corbridge; Mr. E. Beckett, V.M.H.; Mr. Jas. Hudson, V.M.H.; Mr. J. Alexander; and Mr. W. Wells.

17. **Prizes.**—Offers of prizes to be awarded by the Council have been received and accepted from the General Bulb Growers' Society at Haarlem for Forced Bulbs; from Mr. Robert Sydenham for Bulbs grown in fibre; and from Mr. Robert Ker for Amaryllis; the Council having fixed the dates March 8 and 9—the Society's Spring Bulb Show—for their award. Other special prizes and cups will be found mentioned in the Notices to Fellows.

18. **Masters Lectures.**—The foundation of these lectures, in memory of the late Dr. Masters, F.R.S., V.M.H., led the Council to invite Professor Hugo de Vries, of Amsterdam, to deliver the first two lectures during 1909, his subjects being (1) "Masters' Vegetable Teratology," and (2) "The Production of Horticultural Varieties." Both were well attended, and are fully reported in the Society's JOURNAL. The Masters Lecturer in 1910 will be Mr. A. D. Hall, F.R.S., of Rothamsted, who will speak on February 22 and March 22 on the "Adaptation of the Plant to the Soil."

19. **Autumn Fruit and Vegetable Shows, 1910.**—As already announced, the Great Autumn Fruit Show will be resumed in 1910, the date fixed being October 13 and 14. It had been intended to hold a Show of Vegetables at the same or immediately following date, but circumstances have decided the Council to defer the Vegetable Show until Tuesday, October 25. The Schedule of Prizes for both Shows will be issued shortly.

20. **Pritzels' Iconum Botanicorum Index.**—This most invaluable book, containing when first published a list of all the known plates and illustrations of plants, has not been kept up to date, and botanists and horticulturists the wide world over are most anxious for a revision brought up to date. The authorities at Kew have been approached by the Society during the past year with a view to this being done. The estimated cost is about £3,000, and it was suggested that other societies and universities should combine with us to provide the necessary funds, the R.H.S. undertaking to give a handsome proportion. Lieut.-Col. Prain, F.R.S., most kindly interested himself in the suggestion, offering all necessary assistance. It is to be regretted that no further promises of co-operation or of funds have as yet been forthcoming, but all hope of this much needed publication will not be abandoned. It is quite possible that some generous friend of horticulture and of botany might feel disposed to couple his name with such a permanent and enduring work.

21. **International Exhibition.**—From time to time, in recent years, International Horticultural Exhibitions have been held at various centres on the Continent, as at Paris, Berlin, Ghent, Turin, &c. The last occasion on which Great Britain took the part of host in these international courtesies was in 1866, and the Council of the Royal Horticultural Society feel that it is time that our country made an effort to return some part of the hospitality which foreign countries have so often extended to us during the forty years which have elapsed since such a gathering was held in London. It has further been suggested that in connection with it a fourth conference should be held on Genetics—*i.e.* on the origin, breeding, and heredity of plants.

22. **The Hall.**—Many improvements have been made in the Hall to equip it suitably and thoroughly for the growing demand for its occupation. A sound-board has enormously improved the acoustics, it being now possible to address an audience with ease and comfort from beneath it. The old-fashioned arc lamps have been replaced by more modern white enamelled lamps, having an increased illumination; and a finished appearance has been given to the façade by the erection of two handsome bronze standard lamps, one on either side of the main entrance.

23. **Honorary Life Fellows.**—Sir William T. Thiselton Dyer, K.C.M.G., F.R.S., and Sir Daniel Morris, K.C.M.G., V.M.H.,

Dr. ANNUAL REVENUE AND EXPENDITURE

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Ground Rent	690 0 0	
Rates and Taxes	500 18 7	
Water Rate	85 10 0	
Electric Light	271 3 5	
Gas	39 9 6	
Insurances	50 7 0	
		1,637 8 6
Salaries and Wages	1,811 12 6	
Printing and Stationery	1,068 15 8	
Postages	427 13 0	
Fuel	69 3 0	
Professional Fees	100 14 4	
Repairs and Renewals (including £150 for Hall Painting	546 4 0	
Miscellaneous Expenses	321 10 1	
Horticultural Unions	2 12 3	
Portrait (Baron Schröder)	262 10 0	
New Sounding Board	39 15 0	
Bronze Lamps and New Electric Fittings	206 15 0	
		4,857 4 10
„ JOURNAL, PRINTING AND POSTAGE		2,801 16 2
„ WISLEY SCHOLARSHIP GIVEN BY THE SOCIETY		25 0 0
„ PAINTING ORCHID PICTURES		45 15 0
„ LINDLEY LIBRARY		215 7 9
„ SHOWS and MEETINGS—		
Temple Show	889 17 8	
Holland Park Show	709 17 10	
Colonial Show	54 6 11	
Labour, Floral Meetings and Conferences	167 10 2	
Expenses do. do.	157 1 7	
Deputation Expenses (Provincial Shows)	67 16 8	
		2,046 10 10
„ PRIZES and MEDALS—		
Awarded at Society's Shows	544 0 5	
Awarded by Deputation at other Shows	110 3 9	
Special Fruit and Vegetable Prizes	131 7 7	
		785 11 9
„ WISLEY GARDENS—		
Rates, Taxes, and Insurances	74 8 8	
Superintendent's Salary	243 15 0	
Labour	958 11 10	
Garden Implements	55 14 9	
Loam and Manure	113 8 11	
Repairs	59 7 11	
Fuel	233 0 0	
Miscellaneous Expenses	197 5 11	
		1,935 13 0
„ COST of GROWING, PACKING, and DISTRIBUTION of PLANTS to FELLOWS		253 12 1
„ LABORATORY, WISLEY—		
Salaries	321 0 0	
Surrey County Council Scholars	21 11 8	
Miscellaneous Expenses	72 16 2	
Replacement Account	9 6 5	
Prize Fund—Expenditure £10 10 6		
Less Receipts 10 0 0		
	0 10 6	
		425 4 9
„ CONTRIBUTION to MASTERS MEMORIAL FUND		16 9 3
„ DEPRECIATION—		
Hall Glass Roof, Furniture, Glass Houses, Wisley, Plant and Materials		502 15 0
„ BALANCE, carried to Balance Sheet		7,649 4 4
		£23,197 13 3

ACCOUNT for YEAR ending DECEMBER 31, 1909. Cr.

	£ s. d.	£ s. d.
By ANNUAL SUBSCRIPTIONS		15,245 10 6
„ ENTRANCE FEES		343 7 0
„ DIVIDENDS AND INTEREST		1,413 4 11
„ SHOWS AND MEETINGS—		
Temple Show	1,224 0 6	
Holland Park Show	694 7 9	
Colonial Show	44 6 0	
Takings at Hall Shows	267 4 0	
		2,229 18 3
„ JOURNALS AND OTHER PUBLICATIONS—		
Advertisements	729 19 3	
Sale of Publications	439 11 1	
		1,169 10 4
„ HALL LETTINGS	2,304 12 10	
Less Labour Expenses	255 6 4	
		2,049 6 6
„ PRIZES AND MEDALS		200 18 8
„ EXAMINATIONS IN HORTICULTURE—		
Amount received in Fees	154 2 6	
Less expended	95 1 0	
		59 1 6
„ WISLEY GARDENS—		
Produce sold	38 9 1	
Students' Fees	115 10 0	
Inspection of Gardens	248 11 6	
		402 10 7
„ EDUCATIONAL GRANT, WISLEY HORTICULTURAL SCHOOL		73 15 0
„ LIFE COMPOSITIONS—		
Being amount paid by Fellow now deceased		10 10 0
		£23,197 13 3

Dr. **BALANCE SHEET,**

	£ s. d.	£ s. d.	£ s. d.
To CAPITAL FUNDS ACCOUNT—			
As at December 31, 1908		35,396 11 7	
Received since, Life Compositions	404 5 0		
Less Fees paid by Fellow now deceased ...	10 10 0		
		393 15 0	
Masters Memorial Fund		17 9 3	
Nicholson Memorial Fund		12 14 0	
			35,820 9 10
„ SUNDRY CREDITORS			554 8 7
„ SUBSCRIPTIONS, &c., paid in advance			586 12 6
„ LAWRENCE TESTIMONIAL FUND—			
Balance December 31, 1908		389 0 5	
Less paid for Design and Die		262 0 0	
			127 0 5
„ WISLEY SCHOLARSHIP—			
Balance December 31, 1908 ...	18 15 0		
Given by the Gardeners' Company	50 0 0		
Given by the Society	25 0 0		
		93 15 0	
Less paid to Scholars		37 10 0	
			56 5 0
„ RESERVE ACCOUNT—HALL PAINTING ...			150 0 0
„ DEPRECIATION AND RENEWALS RESERVE ACCOUNT—			
As at December 31, 1908		1,478 10 2	
Added this Year		502 15 0	
			1,981 5 2
„ GENERAL REVENUE ACCOUNT—			
Balance, December 31, 1908 ...	49,560 19 1		
Less Bad Debts	12 0 0		
		49,548 19 1	
„ REVENUE FOR THE YEAR, as per annexed Account		7,649 4 4	
			57,198 3 5
			£96,474 4 11

	£ s. d.	£ s. d.
By CAPITAL EXPENDITURE—		
„ NEW HALL AND OFFICES—		
As at December 31, 1908		40,950 11 2
„ FURNISHING HALL AND OFFICES—		
As at December 31, 1908		2,165 6 5
„ DWELLING HOUSES, WISLEY—		
As at December 31, 1908		2,390 5 7
„ GLASS HOUSES, RANGES, POTTING SHED, &c., WISLEY—		
As at December 31, 1908	3,295 15 2	
Expenditure since on Potting Shed and Fruit Wall	801 14 10	
		4,097 10 0
„ LABORATORY, WISLEY—		
As at December 31, 1908		1,627 14 11
		51,231 8 1
„ PLANT AND MATERIALS—		
Appliances for Shows	236 11 0	
Fittings, Wisley	58 8 6	
Horse and Cart, Garden Plant, &c.	89 4 11	
Fencing and Wire Netting, Wisley	102 6 9	
Scientific Instruments and Fittings, Laboratory	175 6 5	
Breakable Apparatus, Laboratory	95 2 4	
		756 19 11
„ SUNDRY DEBTORS...		700 6 10
„ INVESTMENT OF DEPRECIATION AND RENEWAL RESERVE ACCOUNT—		
3½ % India Stock, £1,506 15*s.* 6*d.*		1,478 10 2
„ INVESTMENTS—		
2½ % Consols, £10,576 3*s.* 11*d.* ... *cost* (£2,022 8*s.* 9*d.* of this sum is held by the Society, subject to the provisions of the will of the late J. Davis, Esq.)	9,960 4 9	
£7 Annuity East Indian Railway, Class B, Williams Memorial Fund ... ... *cost*	168 0 0	
3 % Local Loans, £5,800 ... ... „	6,006 16 6	
3½ % Indian Rupee Paper, 37,000 Rupees „	2,462 14 4	
4 % Canadian Inscribed Stock, £2,000 „	2,077 11 0	
2¾% National War Loan, £5,108 12*s.* 11*d.* „	5,000 0 0	
4 % Canadian Pacific Rly. Co. Consolidated Debenture Stock, £4,632 ... ... *cost*	4,999 14 1	
3½ % London County Council Inscribed Stock, £3,000 ... ... *cost*	3,020 13 6	
2½ % Midland Rly. Preference Stock, £400 Masters Memorial Fund ... ... *cost*	290 13 6	
4 % Great Eastern Rly. Debenture Stock, £3,500 ... ... *cost*	3,969 17 3	
3½ % India Stock, £2,063 4*s.* 6*d.* ... „	2,024 10 4	
		39,980 15 3
The approximate value of these Investments on January 1, 1910, *was* £38,549 3*s.* 4*d.*		
„ CASH—		
At Bank	304 9 8	
On Deposit	2,000 0 0	
In Hand	21 15 0	
		2,326 4 8
		£96,474 4 11

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on December 31, 1909.

ALFRED C. HARPER, F.C.A., *Auditor* (HARPER BROTHERS),
Chartered Accountant, 10 Trinity Square, London, E.C.

January 14, 1910.

have been appointed Honorary Life Fellows of the Society under Bye-law XVI.

24. **Colour Chart.**—The effort of the Society to establish an International Standard of Colours by means of a Colour Dictionary, published at the instance of the French Chrysanthemum Society, has been enthusiastically received, at home and abroad, by numerous professions and trades, and several hundred copies have been sold. The work has been most favourably referred to by the Press and by private correspondents, and may still be obtained at our Society's office, price 14*s.* 6*d.*, or by post in the British Isles 15*s.*

25. **Orchid Nomenclature.**—The rapidly increasing number of multigeneric hybrids, and the confusion likely to arise unless a definite system of nomenclature is created, led to the formation of a Special Committee to consider what system would be most suitable. Their report has been received; it summarizes the opinions of expert scientists and hybridists, at home and abroad, and the Council have sent it for consideration at the International Congress to be held at Brussels in April next.

26. **Royal Botanic Society.**—During the year communications have passed between the R.H.S. and the Royal Botanic Society, which have, however, produced no definite result.

27. **Shows in 1909.**—During this year thirty-one Exhibitions, covering thirty-seven days, have been held by the Society.

28. **Obituary.**—The Society has lost many valued friends and supporters during the past twelve months, and among them we regret to find: his Majesty the King of the Belgians, Lord Amherst of Hackney, Hon. Mrs. Cecil Bingham, Col. W. E. Brymer, John Carder, F.R.G.S., Rt. Hon. Sir John Colomb, K.C.M.G., Sir Daniel Cooper, Bart., Cæsar Czarnikow, Sir Charles Gibbons, Bart., James Harper, Charles Jefferies, Earl of Leicester, Lily, Duchess of Marlborough, William Roupell, Dr. G. S. Sutherland, J. Vavasseur, H. G. Rimestad (Java), Peter Barr, V.M.H., Earl of Carysfoot, Norman C. Cookson, John Forbes, Peter E. Kay, V.M.H., Dr. W. H. Dallinger, F.R.S., Dr. W. J. Russell, F.R.S., H. F. Simonds, G. Dickson, V.M.H., &c., &c.

29. **Victoria Medal of Honour.** Of the foregoing list three were valued Victoria Medallists of Honour. The Council have offered the vacant medals to Messrs. W. Botting Hemsley, F.R.S., J. H. Goodacre, and A. Mackellar, who have accepted the distinction.

30. **Retiring Members of the Council.**—Lord Balfour of Burleigh, K.T., Sir Albert Rollit, LL.D., Litt.D., D.C.L., and Mr. James Hudson, V.M.H., retire from office. Each has allowed himself to be renominated.

31. **Annual Progress.**—The following table will show the Society's progress in regard to numerical strength during the past year:—

Loss by Death in 1909.

		£	s.	d.
Life Fellows	18	0	0	0
4 Guineas	1	4	4	0
2 „	49	102	18	0
1 Guinea	70	73	10	0
	138	£180	12	0

Loss by Resignation, &c.

		£	s.	d.
4 Guineas	3	12	12	0
2 „	168	352	16	0
1 Guinea	401	421	1	0
Associates	23	12	1	6
Affiliated Societies	22	23	2	0
	617	£821	12	6
Total Loss	755	£1,002	4	6

Fellows Elected in 1909.

		£	s.	d.
Hon. Fellows	3	0	0	0
4 Guineas	8	33	12	0
2 „	610	1,281	0	0
1 Guinea	584	613	4	0
Associates	26	13	13	0
Affiliated Societies	31	32	11	0
Commutations	16			
£404 5s. 0d.				
	1,278	£1,974	0	0
Deduct Loss		1,002	4	6
Net Increase in Income		£971	15	6

New Fellows, &c.	1,278
Deaths and Resignations	755
Numerical Increase	523
Total on December 31, 1908	10,507
Total on December 18, 1909	11,030

32. **Committees, &c.**—The Society owes a constantly recurring debt to the members of the Committees, the Judges, writers of Papers for the Journal and the compilers of abstracts, the reviewers, Lecturers, and the several Examiners who during the past twelve months have done so much to contribute to the potential energy of the Society's usefulness, and to help maintain its high standing among the practical and scientific institutions of the world. The Council also extend their acknowledgment to the Press for their invaluable assistance in reporting upon and calling attention to the work of the Society.

By Order of the Council,
W. Wilks, *Secretary.*

Royal Horticultural Society,
Vincent Square, Westminster, S.W.
December 31, 1909.

GENERAL MEETING.

February 22, 1910.

Professor Arthur Dendy, D.Sc., F.R.S., in the Chair.

Fellows elected (89).—Mrs. Adams, Miss K. E. Amos, Mrs. H. W. Anderson, Mrs. L. C. Archer, Mrs. F. W. Baker, R. Beattie, C. G. Bird, Miss Booth, Miss C. F. Bosley, A. H. Bowles, F. Bradley, Mrs. Buller, Bruce Butler, Mrs. Cadell, C. P. Cardell, A. S. Cauty, Mrs. J. Clark, Miss Crawshay, Major Creagh, J. B. Currie, Major Cuthbertson, Mrs. W. H. Daniel, H. V. S. Davids, H. Davies-Colley, C. R. de la Salle, A. J. Demaret, Mrs. C. W. Dixon, Captain A. Dorrien-Smith, R. A. Dumner, A. Easton, T. S. Esson, F. W. Fenning, Rev. H. C.

Fitch, M.A., J. Foster, Colonel Wolrige Gordon, Miss J. Gundry, Mrs. Hargreaves, C. Heath, G. A. Hensley, C. K. Hitchcock, R. R. Hollins, Captain T. Hone, Mrs. H. G. Humby, Mrs. Hunter, Rev. Cecil J. Jones, John Jones, Madame Kato, A. R. Kay, C. J. Kingzett, Mrs. Knapp, Mrs. Luxmoore, Mrs. W. R. Lyle, A. H. McNeil, Mrs. F. D. Marshall, Mrs. C. M. H. Massey, E. S. Matthews, Mrs. H. Mills, T. E. Miln, Miss Murray, the Baroness Nordhoff, Lady Northcote, H. R. Peake, Miss M. L. Pochin, J. S. Pollock, L. Porter, K. L. C. Prescott, Miss C. C. Prescott, Sir Frederick Price, K.C.S.I., Mrs. Relton, Mrs. Stuart Rickman, Viscountess Ridley, C. F. Ritchie, G. Robertson, Sidney Robinson, William Russell, C.B., Mrs. Rathven-Smith, J. Sawyer, H. Alan Scott, Mrs. W. Scully, Mrs. Steele, Miss Strange, C. Taborn, Mrs. C. H. Tapply, George Taylor, Miss F. H. C. Trench, L. Turner, A. von der Meden, Mrs. J. White, Mrs. Wykeham.

Fellow resident abroad (1).—C. H. Ridler (Mombasa).

Associates (5).—Miss Everitt, Miss Garlick, G. Parkes, Miss E. Phillimore, Miss G. Tolson.

Societies affiliated (2).—Seale and Tongham Gardeners' Association, Street Rose and Sweet Pea Society.

The third Masters Memorial Lecture was given by Mr. A. D. Hall, F.R.S., on "The Adaptation of the Plant to the Soil" (see p. 1).

GENERAL MEETING.

March 8, 1910.

Mr. E. A. Bowles, M.A., F.L.S., in the Chair.

Fellows elected (102).—W. M. Anderson, Mrs. Bailey, Mrs. J. H. Bailey, Mrs. R. D. Balfour, Mrs. Beauchamp, B. E. Bell, Mrs. Bennett, H. O. Blackwood, T. R. Blundell, Mrs. Bower, Miss A. V. Brickenden, J. M. Bridgeford, Miss Bristow, Mrs. Emsley Carr, Mrs. S. Chamberlayne, H. Clark-Payne, Miss M. Courtenay, Mrs. W. Cripps, Sir William Crossley, Mrs. J. H. Culme-Seymour, Lady Currie, H. L. Dampier, J.P., Mrs. Dangerfield, A. Duncan, C. H. Dyke, Mrs. J. Eckersley, S. S. Moore Ede, Gervase Elwes, Captain R. B. Feilden, Mrs. J. Fleming, Mrs. E. Fowler, Mrs. Furneaux, Mrs. Garland, W. Garraway, F. C. Gayton, Commander H. G. Glennie, R.N., Mrs. Gribble, Lady Hamilton, Edward Hart, Mrs. Harte, Miss B. Helyar, Mrs. R. Hepburn, H. E. Holmes, Mrs. Hurtzig, Mrs. H. P. Hussey, J. O. Ince, Mrs. E. F. Jackson, Mrs. W. Jude, the Dowager Countess of Kenmare, Mrs. Kersey, J. Lake, Lady Le Marchant, Mrs. A. Little, Miss Lyall, Lady McCalmont, Mrs. Macleod, Mrs. Macpherson, Mrs. W. Mason, Mrs. F. Mayhew, E. J. Moore, Miss D. R. Moore, A. G. Morris, H. D. Moule, C.S.I., Lady Neave, Mrs. R. Norton, Mrs. Odling, A. J. Paine, F. R. Palmer, H. Palmer, M.A., E. D. Park, E. D. W. Reed, Mrs. A. Reynolds, H. W. Robinson, Major C. E. Rogerson, Miss A. F. Rolt, J. A. Scott, F.C.A., Mrs. J. L. Scott, B. Scrase-Dickins, Lady Sendall, W. Sharratt, Miss

A. Shearburn, H. Shorrock, Lady Sibbald, F. Simpson, Mrs. J. Sinclair, Rev. L. B. Sladen, Miss Staples, Mrs. Stewart, E. J. Syer, Mrs. H. C. Thiselton, Mrs. Thompson, Mrs. W. Graham Thompson, Mrs. E. Wythe Thompson, Mrs. G. Tragett, W. E. Turnbull, Miss B. Vickers, Miss E. Waller, R. Ward, Rev. A. M. West, Mrs. P. B. Wilbraham, Mrs. A. B. Williamson, F. Woollard.

Fellow resident abroad (1).—Walter Fox (Singapore).

Society affiliated (1).—Great Shelford Horticultural Society.

A lecture on "Plant Hygiene" was given by Mr. F. J. Baker, A.R.C.S. (see p. 73).

SHOW OF SPRING BULBS.

Tuesday and Wednesday, March 8 and 9.

A Special Exhibition of Forced Spring Bulbs was held, the object of the Show being to demonstrate the varieties best suited for gentle forcing, and exhibits of small and large collections were invited from Amateurs and the Trade. R.H.S. Medals were awarded according to merit.

Hyacinths, Tulips, and Daffodils.

The Council offered (subject to the General Rules of the Society) the following Prizes presented to them by the General Bulb Growers' Society at Haarlem:—

Regulations.—For Classes 3, 4, and 5, each bulb must be in a separate pot (size optional). Classes 3, 4, 5, and 6, must be all single spikes; no spikes may be tied together. Exhibitors may compete in one only of the Classes numbered 3, 4, and 5. All bulbs must have been forced entirely in Great Britain or Ireland.

Division I.—For Amateurs.

Class 3.—Eighteen Hyacinths, distinct.

First Prize, £6 6*s.*; Second, £5 5*s.*; Third, £4 4*s.*; Fourth, £3 3*s.*; Fifth, £2 2*s.*; Sixth, £1 1*s.*

1. Hon. Vicary Gibbs, Aldenham House, Elstree (gr. E. Beckett, V.M.H.).
2. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
3. F. von Heyder, Esq., Stone House, Allerton, Liverpool (gr. A. Lewis).

No other entries.

Class 4.—Twelve Hyacinths, distinct.

First Prize, £5 5*s.*; Second, £4 4*s.*; Third, £3 3*s.*; Fourth, £2 2*s.*; Fifth, £1 1*s.*

1. Marquis of Salisbury, Hatfield House, Hatfield (gr. H. Prime).
2. A. Earle, Esq., Childwall Hall, Wavertree, Liverpool (gr. T. Hitchman).
3. C. Watney, Esq., Garston Manor, Watford (gr. G. Dyke).
4. W. G. Woodhouse, Esq., Childwall Abbey, Liverpool (gr. T. Hudson).
5. Lord Hillingdon, The Wildernesse, Sevenoaks (gr. J. Shelton).

Class 5.—Six Hyacinths, distinct.

First Prize, £2 2*s.*; Second, £1 10*s.*; Third, £1 1*s.*; Fourth, 10*s.*

1. A. Hanson, Esq., Ivanhoe, Victoria Park, Wavertree (gr. R. T. Bushell).

No other entries.

Class 6.—Four Pans containing Hyacinths, 10 roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans they are shown in.

First Prize, £4 4*s.*; Second, £3 3*s.*; Third, £2 2*s.*; Fourth, £1 1*s.*

1. Hon. Vicary Gibbs, Aldenham House, Elstree (gr. E. Beckett, V.M.H.).
2. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
3. Marquis of Salisbury, Hatfield House, Hatfield (gr. H. Prime).

No other entries.

Division II.—For Trade Growers.

Class 7.—Collection of 200 Hyacinths, in at least 36 varieties grown in pots or glasses.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Messrs. Cuthbert, The Nurseries, Southgate.

Class 8.—Collection of 200 Hyacinths, in 20 varieties in pans. Ten roots of one variety in each pan. The bulbs need not have been actually grown in the pans they are shown in.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Messrs. Cuthbert, The Nurseries, Southgate.

Bulbs Grown in Moss Fibre, &c.

Subject to the General Rules of the Society the Council offered the following Prizes presented to them by Mr. Robert Sydenham:—

Classes 9, 10, 11.—*Bulbs grown in moss fibre or similar material (not earth)* and without drainage.

Amateurs.

Class 9.—Six single Hyacinths, in separate vases, not exceeding 6 inches in diameter, to be selected from any one of the following varieties: 'Innocence,' 'Isabella,' 'Jacques,' 'Johan,' 'King of the Blues,' 'Koh-i-Noor,' 'Ornament,' 'Rose,' 'Princess May,' 'Queen of the Blues,' 'Roi des Belges,' 'Rose à Merveille,' 'Schotel.'

Prizes—25*s.*, 21*s.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

1. Lady Tate, Park Hill, Streatham Common (gr. W. Howe).
2. Miss C. A. Michell, Oakfield, Cricklewood, N.W.
3. Mrs. S. V. Dardier, 6 Grange Road, Ealing.
4. Hon. Mrs. Guy Baring, St. Cross, Winchester (gr. G. Bates).
5. Countess Cowper, Panshanger, Hertford (gr. W. Staward).

Class 10.—Six vases of Tulips (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Duchesse de Parme,' 'Duzart,' 'Fabiola,' 'Joost van Vondel,' 'Keizerskroon,' 'Mon Trésor,' 'Prince of Austria,' 'Rose Gris de Lin,' 'Thomas Moore,' 'Van der Neer,' 'Vermilion Brilliant,' 'White Pottebakker.'

Prizes—25*s.*, 21*s.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

1. Lady Tate, Park Hill, Streatham Common (gr. W. Howe).
2. Mrs. S. V. Dardier, 6 Grange Road, Ealing.
3. Mrs. Marian Gordon Thompson, The Elms, Potter's Bar.
4. Hon. Mrs. Guy Baring, St. Cross, Winchester (gr. G. Bates).
5. Countess Cowper, Panshanger, Hertford (gr. W. Staward).

Class 11.—Six vases of Narcissi (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Beatrice,' 'Beauty,' 'C. J. Backhouse,' 'Emperor,' 'Frank Miles,' 'Glitter,' 'Horace,' 'Léonie,' 'Lilian,' 'Lulworth,' 'Madame de Graaff,' 'Phyllis,' 'Victoria,' 'White Lady.'

Prizes—25*s.*, 21*s.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

1. Lady Tate, Park Hill, Streatham Common (gr. W. Howe).
2. Hon. Mrs. Guy Baring, St. Cross, Winchester (gr. G. Bates).
3. Miss C. A. Michell, Oakfield, Cricklewood, N.W.
4. Mrs. S. V. Dardier, 6 Grange Road, Ealing.

No other entries.

Prizes for Amaryllis.

The Council further offered (subject to the Society's Rules) the following Prizes presented to them by the Messrs. Robert P. Ker & Sons:—

Amateurs.

Class 12.—Twelve pots of Amaryllis (Hippeastrum) distinct. Each pot must contain one bulb only. Size of pots optional.

Prizes—£3; £2; £1.

J. Arthur Kenrick, Esq., Berrow Court, Edgbaston (gr. A. Cryer).

No other entries.

GENERAL MEETING.

March 22, 1910.

Mr. W. Bateson, F.R.S., V.M.H., in the Chair.

Fellows elected (78).—A. B. Bacon, E. P. Baily, Mrs. Barry, Miss L. Bentham, Mrs. Bonney, E. W. Bottle, W. C. Brown, Colonel W. Capper, Mrs. J. L. Carew, Mrs. Chamberlayne, Hon. Mrs. Cuthbert Chapman, W. J. Cockrem, J. C. Cockshutt, P. Cockshutt, Mrs. Strickland Constable, Mrs. J. Crosfield, Mrs. H. Wingfield Cross, Mrs. Cruickshank, Mrs. Cunningham, W. S. Curtis, N. David, Miss E. T.

Down, Miss Ellis, Mrs. G. Ellison, Mrs. F. Faulkner, Mrs. Fraser-Tytler, Hon. Mrs. A. Gathorne-Hardy, W. Gill, Miss Haldane, Mrs. R. Heywood, R. Heywood, Mrs. W. Hicking, Lady Horner, Miss Houldsworth, H. Howard, R. Howard-Smith, H. Jennings, Mrs. Lewis Jones, C. D. Kemp-Welch, J.P., Miss Lake, F. B. Larkworthy, Rev. T. N. Leeke, Dowager Countess of Leicester, Dr. G. A. Leon, Geoffrey Lubbock, Miss A. Scott Mackirdy, R. E. Mawson, Miss Mellersh, Mrs. R. G. Milligan, Miss More-Nisbett, W. A. Murray, Mrs. A. F. Pearson, G. L. Pilkington, Mrs. G. L. Pilkington, Hon. Mrs. Orde Powlett, T. H. Russell, Lieut.-Colonel T. B. Savi, J. F. Schwann, J.P., Dr. Alexander Scott, F.R.S., L. Smeathman, Cyril A. Smith, R. Tilden Smith, Mrs. S. Spiers, Mrs. J. Sturgis, Mrs. A. Sutro, Miss E. M. Taylor, W. Tyrrell, D. A. F. Vesey, R. A. Vinter, B. J. Walker, Mrs. D. S. Waterlow, Lady Wells, A. F. Whinney, Mrs. Wilkins, G. H. Wilkinson, D. M. Wilson, Miss S. G. Woods, Mrs. T. C. Worsfold.

Associate (1).—George Holden.

The Fourth Masters Memorial Lecture was given by Mr. A. D. Hall, M.A., F.R.S., on "The Adaptation of the Plant to the Soil" (see p. 11).

GENERAL MEETING.

April 5, 1910.

Mr. F. J. Chittenden, F.L.S., in the Chair.

Fellows elected (52).—Miss Allgood, Rev. A. J. Back, E. L. Balcombe, Major S. L. Barry, D.S.O., T. B. Bowring, Dr. R. Chetham-Strode, Mrs. C. S. Cockburn, Mrs. A. C. Cole, Lady Colvile, Sir Anthony Compton Thornhill, Mrs. Wyndham Cremer, Miss F. C. Curtis, Mrs. J. S. Davy, Jersey de Knoop, H. Dixon, L. C. Docker, Miss G. Erskine, G. A. Esson, Mrs. Eykyn, Miss Friend, H. M. Fletcher, R. B. Gittins, Colonel R. C. Hellard, C.B., A. L. Hetherington, Mrs. O. Hicks, Count Conrad Hochberg, Mrs. Izod, Miss Amy L. Lawrence, Mrs. A. G. Lucas, Andrew Lusk, Mrs. C. R. Lyster, Mrs. Ellison Macartney, Mrs. J. M. Marshall, W. Mason, Lady Morshead, T. W. Noad, Lady Petre, A. W. Player, Miss M. Purcell, R. W. Reid, Mrs. Ridpath, Dowager Countess of Rosse, Mrs. J. S. Russell, Mrs. A. E. Seaton, G. Shrubsall, T. Stephenson, Mrs. H. Stokes, J. C. Vidler, W. Walker, Miss E. A. Warre, Mrs. G. Watson, Mrs. E. Wilson.

Fellows resident abroad (2).—Jan C. Hauptfleisch (Cape Colony), Mrs. Jerom Topham (Natal).

Associate (1).—F. Bailey.

Societies affiliated (3).—Cardiff Gardeners' Association, Marlborough Horticultural Society, West Birmingham Horticultural Society.

A Lecture on "The Use of the Spectroscope in the Study of Plant Life" was given by the Rev. G. Henslow, V.M.H. (see p. 82).

DEPUTATION TO HAARLEM,

April 13 to 16, 1910.

The Deputation of the R.H.S. to the Haarlem Jubilee Exhibition of the Dutch Bulb-Growers' Society was originally intended to consist of six representatives, but owing to insurmountable difficulties only Messrs. Harry J. Veitch, V.M.H., Alfred H. Pearson, and E. Augustus Bowles, M.A., were able to carry out their engagement to visit Haarlem on behalf of the R.H.S. from April 13 to April 16. The Exhibition itself furnished not only great interest and pleasure from the quality of the exhibits, but also afforded a valuable lesson in artistic skill and clever management in the planning of the show arrangements generally. It was a wise thought to place the Exhibition in the beautiful setting of the Deer Park, with its fine central avenue and picturesque groupings of well-cared-for trees; and great praise is due to the architect of the Exhibition, Mr. Leonard A. Springer, for the skilful way he planned the arrangements of formal gardens in the broad central space and utilized the smaller glades on either side without interfering with the natural beauty of the groups of trees or giving any idea of overcrowding. Would that our English authorities would similarly allow the R.H.S. to hold one of its shows in one of our Public Parks!

All the outside exhibits were planted in beds, thus giving the effect of a permanent garden instead of a merely temporary show. The masses of Crocus which had figured so largely at a previous show were now replaced by Hyacinths, grown for the purpose in boxes, which were sunk in the beds, and were destined in their turn to be replaced by Tulips, grown in a similar manner for a later show.

Inside the larger of the covered buildings the effect was again that of plants growing in a garden; for the central spaces were laid with turf, in which formal beds were arranged, and by the co-operation of the various firms exhibits of a like character were combined so as to form one harmonious whole. In this way one of these arrangements of beds was composed of fine collections of various Azaleas, a different firm of growers filling each bed.

The Deputation made the following awards:—

Gold Medal.

To Mr. C. G. van Tubergen, jun., for a collection of new and rare plants, beautifully arranged in a series of eight formal beds cut out of a small stretch of turf, and with specimen plants of *Gloriosa Rothschildiana*, *Lilium philippense*, and others in pots sunk in the turf. A fine collection of *Tulipa* species, including *T. Greigi*, *T. Fosteriana*, and *T. Eichleri*, filled one bed. Another contained some rare terrestrial Orchids, while *Anemone nemorosa Alleni*, *A. ranunculoides* vars. *pallida* and *fl. pl.*, *Zephyranthes carinata*, *Haemanthus multiflorus*, *Habranthus pratensis*, *Paeonia Wittmanniana*, *Iris bucharica*, *Freesia*

Chapmanii, and many fine *Lachenalias* were among the many beautiful plants comprising this fine group.

Silver Gilt Flora Medal.

To Messrs. C. B. van Nes, for a fine group of the three Rhododendrons, 'Pink Pearl,' 'White Pearl,' and the new intermediate shade 'Princess Juliana.'

To Mr. J. Hardijzer, of Boskoop, for a group of Conifers, Hollies, and other evergreen plants.

Silver Gilt Banksian Medal.

To Messrs. Kersbergen Brothers, of Boskoop, for seedling varieties of *Azalea mollis*.

Silver Flora Medal.

To the Lisse Association of Dutch Bulb Growers, for beds of Hyacinths.

To the Firma Wezelenburg for a group of forced plants, such as Prunus, Azalea, Wistaria, etc.

To Mr. D. Baardse Dzn for Begonias and Hydrangeas evidencing exceedingly fine cultivation.

Silver Banksian Medal.

To the Heemstede Association of Dutch Bulb Growers for a singularly tasteful arrangement of beds filled with various shades of colours of bedding Hyacinths.

To Messrs. van Waveren for beds of hardy plants and a group of Lilies in the open air.

To Messrs. de Graaf Brothers for Narcissi.

To the National Horticultural Winter School for a collection of specimen plants of Japanese Maples.

Bronze Banksian Medal.

To Mr. H. Dames, of Lisse, for beds of Hyacinths.

The arrangements for the show were in the hands of an executive committee under the presidency of Mr. Theodore van Waveren, and it would be impossible to praise too highly the way in which everything was planned and carried out.

Mr. E. H. Krelage presided at the meeting of judges and the formation of the sections, and both then and also afterwards at the luncheon, addressed the members in a four-fold speech of French, English, German, and Dutch. To his ability, energy, and courtesy the success of the meeting and of the entertainments was largely due.

A varied programme of hospitalities was offered to those taking part in the show. The Deputation wish especially to express their thanks to the Burgomaster of Haarlem, Sir Jacob Boreel van Hogelanden, Bart., and Lady Boreel, for the reception in the beautiful Town Hall; to the Dutch Bulb Exporters' Association for the raout on the evening

of April 16; and to the General Bulb Growers' Society for the luncheon in the Exhibition Grounds on the Thursday, the automobile drive through the bulb-growing district on Saturday, and the Banquet at the Hôtel Fünckler on the Friday evening. The last-named was an especially brilliant gathering, and was attended by the Prime Minister Heemskerk, the Minister for Foreign Affairs De Mavees van Swinderen, the Minister for Agriculture, Commerce, and Industry, Talma, who is also a President of Honour of the Exhibition; and the Minister for Public Works, Post, and Telegraph, Regout. Would that our prominent men in this country would display the same interest in horticulture as is done universally by all foreign States, with the exception, perhaps, of San Salvador, Montenegro, and Persia!

GENERAL MEETING.

April 19, 1910.

Mr. James Hudson, V.M.H., in the Chair.

Fellows elected (86).—Captain J. F. Anderson, Lord Ashby St. Ledgers, Dr. W. G. Bigger, R. W. Blaxill, Mrs. Bircham, G. W. Carey, Miss J. D. Cole, T. H. Coombes, Mrs. A. Coveney, T. W. Craig, Miss E. Croome, A. P. Davison, Mrs. P. Dollar, Mrs. K. Durward, Hon. Mrs. J. C. B. Eastwood, Mrs. L. Fisher-Rowe, D. S. B. Gaunt, C. J. Gibson, Mrs. Godden, Lady Cécilie Goff, Mrs. Hamilton Gordon, J. Braidwood Gray, Mrs. Grenander, Mrs. R. Gurney, Dr. T. E. Harper, E. Gathorne Hill, Mrs. Hugill, Rev. A. E. Jalland, Mrs. Webber Gerrard, Paul Jolly, Mrs. Keep, M. W. Knapp, Mrs. Curtis Lampson, Mrs. C. Lancaster, Miss Y. Le Roy-Lewis, E. P. Lewis, Mrs. F. G. Lomax, C. Manchester, Mrs. Miland, C. G. Morgan, the Earl of Morley, Mrs. Moses, G. F. Neame, Miss Neild, Mrs. Nichols, Miss F. C. E. Oakley, H. T. Olney, Mrs. E. Otter, W. A. Paynter, Miss Petrie, Mrs. Phillips, Manning Pike, H. A. Potter, Mrs. H. C. Talbot Rice, T. H. Riches, Rev. W. H. Rigg, Miss J. Royse, H. Lawrence Scott, W. H. Semmens, F.R.G.S., T. H. Slade, Miss J. M. Smith, Mrs. R. Elsey Smith, Mrs. Sydney A. Smith, Miss Sparks, Mrs. H. Staunton, R. Melville Stephens, H. Stredwick, Miss Clara G. Stuart, Mrs. Teall, Mrs. E. W. Thomas, Miss L. M. Tuke, G. E. Turner, Sir Richard Udney, Alsager Vian, Mrs. J. Waghorn, C. Warner, F. D. Watson, Mrs. J. H. White, Mrs. Whitnall, Captain T. E. P. Wickham, D.S.O., Miss Williams, Mrs. Watkin Williams, Mrs. H. C. Willmott, the Dowager Lady Wilson, Miss F. A. Wilson, Mrs. Wyrley-Birch.

Fellows resident abroad (2).—E. Holmes-Smith, B.Sc. (Burma), Thomas King (N.S.W.).

Associates (3).—Miss N. S. How, W. R. Rogers, Miss W. Shakespear.

A Lecture on "The Wild Flowers of the West of Ireland" was given by Mr. R. Lloyd Praeger, B.E., B.A., M.R.I.A.

DAFFODIL SHOW.

Tuesday, April 19.

Class 3.—Messrs. Barr & Sons presented to the Society a Silver Cup, valued at £7 7*s*., as a prize for a group of Daffodil blossoms grown entirely outdoors, Polyanthus excluded, Doubles optional, but must include some of each of the other sections, and must contain at least thirty varieties distinct; at least three blooms of each must be shown. Not more than nine blooms of any one variety may be put up. To be staged in bottles, vases, or tubes not exceeding 3 inches in diameter at the top (inside measurement), and all the stems must touch the water. Quality of flower will count more than quantity, and correct naming and tasteful arrangement will be duly considered. Any hardy foliage may be used, Daffodil or otherwise. No prize will be awarded unless there are three competitors at least. Open to amateurs only.

First Prize, The Cup; Second, Silver Flora Medal.

Past winners of this Cup may exhibit, but will not be eligible to receive the Cup more than once in three years. In the event of any previous winner being adjudged "first," a medal will be awarded instead of the Cup, which will go to the next best exhibit, provided that the judges consider it to be of sufficient merit.

Cup: Rev. G. P. Haydon, Westbere, Canterbury.

Silver Flora Medal: Rev. Canon W. W. Fowler, Earley Vicarage, Reading.

SCIENTIFIC COMMITTEE.

JANUARY 11, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair,
and fourteen members present.

Nomenclature of garden plants.—The Secretary reported that a recommendation on the nomenclature of garden plants had been drawn up for and sent to the Horticultural Congress at Brussels in the spring.

Polygonum.—Mr. J. Fraser, F.L.S., showed specimens of *Polygonum alpestre*, which was at one time naturalized at Kew, where it had grown for thirty years, but its habitat had been destroyed by the erection of the new bridge and the plant exterminated. He also showed specimens of *Polygonum amphibium*, showing the two forms (which are sometimes recognized by botanists as distinct) growing on one and the same root.

Variation in Ferns.—Mr. Chittenden, F.L.S., showed a specimen of a variegated form of *Nephrolepis canaliculata* from Wisley, where Mr. Blakey, the propagator, had noticed a solitary specimen among a batch of young plants in 1908. The plant was isolated, and in 1909 produced spores, which were sown by themselves, and some 300 young plants were raised. Every plant showed the variegation in a greater or less degree, some more markedly than the parent, some less. The variegation was in no plant particularly marked, but the case is interesting as an example of a sudden variation in kind being reproduced true, although the degree of development of the variegation, which probably depends largely upon external conditions, differed in the several plants. He also showed a specimen of a congested form, which likewise reproduced the variation in every plant raised from its spores. The breeding true to a sudden variation does not appear to be at all uncommon, especially if care is taken to isolate the plants before the spores are gathered in order to prevent mixtures of spores and possible crossing.

Variation in Bean seeds.—Mr. H. J. Veitch, V.M.H., showed a number of Bean seeds, the history of which is as follows: In May, 1908, Mr. James Scott, of The Glade Gardens, Ditton Hill, sowed seed of the dwarf Bean 'Plentiful.' These are of a rather pale dun colour. After gathering beans several times, the plants showed a tendency to climb, and subsequently reached a height of five feet. The flowers were pale heliotrope. After harvesting, the seed was found to have a dark testa, marked by light splashes. These seeds were sown in 1909, and produced plants reaching a height of six feet, and bearing foliage considerably larger than that of the ordinary Scarlet Runner, while the flowers were of three colours—pure white, pale heliotrope, and brownish. The seed of this generation varied greatly in colouring, the following types being present: White, with extremely pale veinings; purplish-brown; pure black; reddish-brown; pale pink, with

brown streaks and splashes; dark greyish-brown, with pale grey mottling; pale pink, with dark grey-brown streaks and splashes; dark dun, with whitish dots; dark red-brown; dark grey, with whitish mottling; red brown, with whitish streaks and patches; and grey, with white dots and markings. The original colour of the testa does not appear to have been reproduced.

The seed will be grown, and the behaviour of the seedlings followed. A probable explanation is that the crop was cross-pollinated in 1907, and segregation occurred in 1909. There is, of course, a possibility that crossing occurred also in 1908, as bees were present within a short distance, and other Beans were growing about fifteen yards away; but Beans are usually self-pollinated.

Virescent Cyclamen.—Mr. Fabius, Emsworth, sent a plant of Cyclamen bearing rosettes of small, leathery, green leaves in place of flowers. All the flowers were modified in this way. No trace of similar malformation had been noticed in the strain before. It had been raised at Emsworth, and all the plants for seed purposes were hand-pollinated. Mr. Bowles and Mr. Hill took examples to endeavour to root the rosettes and note their subsequent behaviour.

Eriodendron anfractuosum.—Mr. E. H. Seed, Mombasa, British East Africa, sent pods and seed of this wild Cotton tree, which grows abundantly in the neighbourhood of Mombasa. The trees bear when about four or five years old, and attain a height of from 40 feet to 70 feet, growing very quickly. The pods are about 3 inches in length, and when ripe burst open, so that the white cotton-like substance is set free and distributed by gusts of wind, carrying the seed with it. The cotton is beautifully soft and silky, but the fibres are not very long, and are probably unsuitable for spinning, but it is used for making life-buoys in Africa, and for a variety of other purposes in India, where the species also grows. The tree is valuable also for its timber. A few of the natives collect the pods and sell them to Indians in Mombasa, but it is probable that many other uses might be made of the material than at present.

Orchid hybrid between albinos.—Mr. Thwaites, Streatham Hill, showed a flowering plant of *Cattleya Gaskelliana alba* ♀ × *C. Mendelii alba* ♂. The flowers were not pure white, as in the parents (although they appeared to be so in the bud), but had a faint and very pleasing pearly-pink flush over them. So far, two plants have flowered with the same character; others are in bud.

Scientific Committee, January 25, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Isoloma erianthum.—Mr. Odell showed a specimen of an *Isoloma*, probably *I. erianthum*, figured in *Botanical Magazine* 7907; but the flowers were of a deeper red than in the figure.

Cyclamen latifolium (persicum).—Messrs. Barr showed plants of *Cyclamen latifolium* grown from corms collected near Smyrna, in Asia Minor. The amount and distribution of the white markings on the foliage showed considerable variation, and there was also some amount of variation in the extent of the pink suffusion on the white ground of the flowers, which were much smaller than those of the cultivated plant, and possessed of a very sweet scent, too often lacking in those at present cultivated. Mr. Sutton remarked that the plant was exceedingly common in Palestine; but the corms were usually too large to remove.

Scientific Committee, February 8, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

Seedling Cyclamens.—Mr. Herbert Chapman, Rye, showed a large number of seedlings raised from seed of *Cyclamen ibericum roseum*, which had been pollinated (without previous castration) with pollen of *C. latifolium*. The seedlings flowered earlier than seedlings raised from *C. ibericum roseum* pollinated with its own pollen, and the flowers were larger than those of the seed parent, but otherwise they showed no sign of hybrid origin. Mr. Chapman is carrying on further work with these plants.

Cyclamen latifolium (persicum).—Several plants of the greenhouse *Cyclamen* were exhibited by Mr. A. W. Sutton, V.M.H., to illustrate new strains of this very variable plant. A plant of the common type was shown to compare with them. The flowers included a large-flowered almost magenta one, with broad-fringed petals; a white flower with fringed petals, red at the throat and tipped with pink; a pink flower with very slightly frilled petals, undulate at the edges, red at the throat, and tipped with deep pink; and others varying from white to deep rose, and fringed to a greater or less extent.

Variation in Crocus chrysanthus.—Mr. Bowles showed a series of flowers of seedlings raised from *Crocus chrysanthus*, illustrating the enormous range of colours in the flowers of this species. He said the range was so great as to render it practically impossible to separate *C. chrysanthus* from *C. biflorus*.

Malformation in Primula sinensis.—From Mr. Etherington, of Lewisham, came some specimens of *Primula sinensis* (*stellata*) with numerous dwarf flowers at the base of the umbel. Mr. Crawshay took the plants for further investigation. (See p. xxix.)

Fasciation in Russelia juncea.—Mr. W. H. Patterson, of St. Vincent, W. Indies, sent an interesting case of fasciation in *Russelia juncea*. Fasciation, though a very common phenomenon, is rare in xerophytic plants. In the present case the plant had, however, not been growing under normal xerophytic conditions, but had been in garden soil, and received more water and earth salts than usual.

Bulbs failing.—A number of Hyacinths were sent, in which the roots were either entirely wanting or were much decayed. Although both eelworms and bulb mites were present, their numbers were so small, and the appearance of the bulbs so much unlike the damage done by

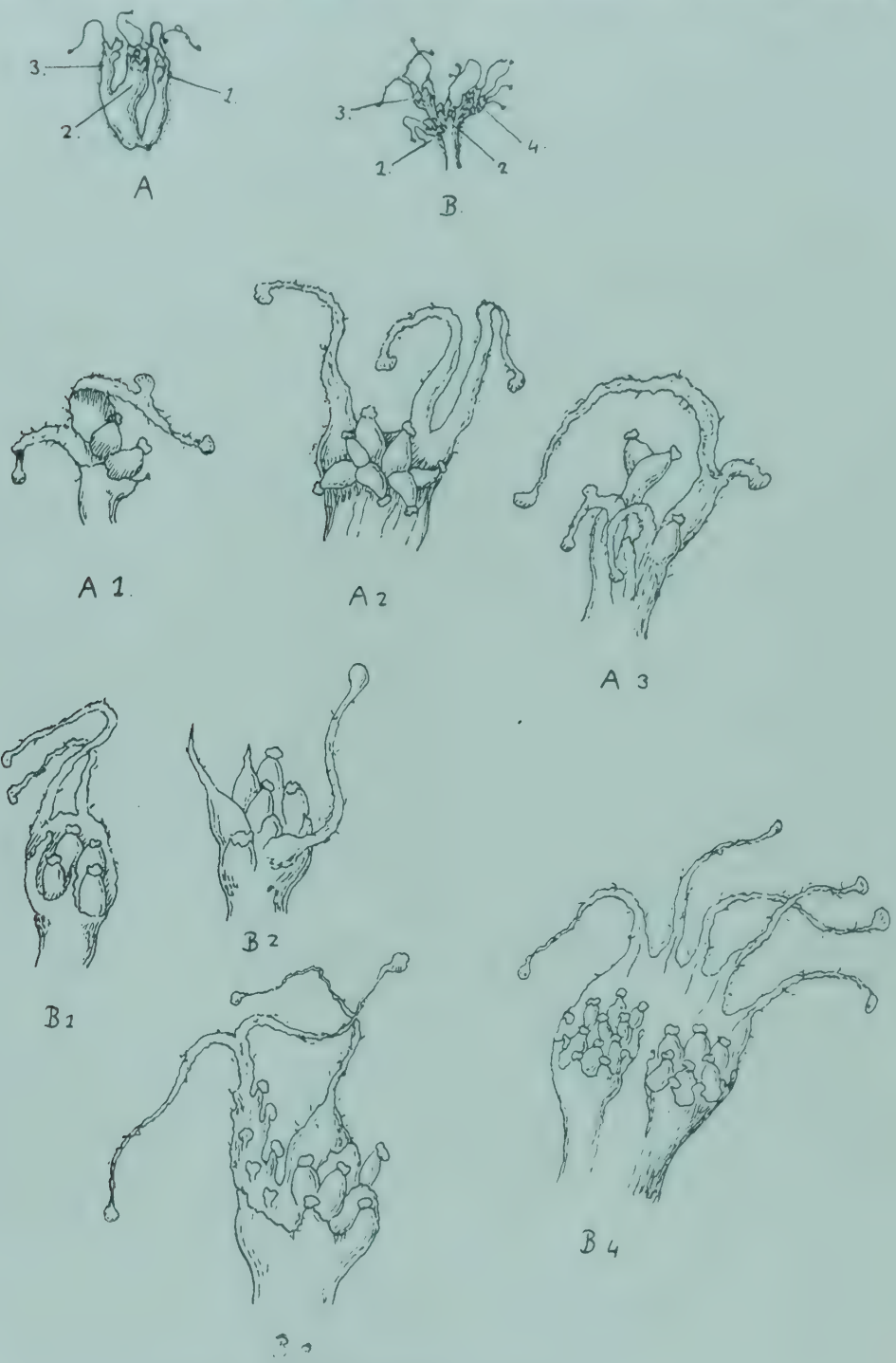


FIG. 67.—MALFORMATIONS IN PRIMULA SINENSIS.

these pests, that the Committee thought the failure of the roots must have been due to some such cause as too great a supply of moisture in the soil when the roots were first formed, which led to their suffocation and decay.

Scientific Committee, February 22, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and seventeen members present.

Azalea gall.—Mr. L. Crawshay showed a specimen of the gall on *Azalea indica* caused by *Exobasidium japonicum*. See Journal, R.H.S., xxxiv. (1908), p. 45. Several examples of this gall have been received lately, and the disease would appear to be spreading. The galls should be picked off and burned as soon as discovered.

Cyclamen coum.—Messrs. Jackman sent a pan of *Cyclamen coum album multipetalum*, a form differing from the type in having seven or eight petals instead of five, so that the flower appeared much rounder than usual.

Acacia dealbata.—Mr. Worsley remarked that he had noticed in Portugal two forms of this plant, one having a smooth bark somewhat silvery in colour, the other rough. There seems to be no record of these variations, and the flowers shown exhibited no marked variation.

Alleged rust-preventing wood.—Dr. Voelcker inquired concerning a Formosan wood which he exhibited, called in the vernacular "Sian-lam," which, it was alleged, had the peculiar property of preventing the rusting of iron and steel. Dr. Henry had informed him that he had known a wood in Formosa under that vernacular name. Shavings of this wood were steeped in water so as to extract a gummy secretion, which Chinese ladies used for dressing their hair, but he had never heard rust-preventing powers ascribed to the wood. Mr. Holmes took the specimen shown in order to examine it further (see p. xxxi.). Dr. Voelcker also made some remarks upon variation in Primroses, said to be correlated with different soils. The Committee desired to see specimens if possible.

Lichens on Azalea mollis.—An inquiry with respect to the destruction of lichens (*Parmelia physodes*) on *Azalea mollis* was received from Fleet, Hants. It was recommended that the plants should be sprayed with a solution of copper sulphate (1 lb.) in water (25 gallons), while the plants were leafless.

Malformation of Primula sinensis.—Mr. L. Crawshay reported that he had examined the specimen of *P. sinensis* (*stellata*) shown at the last meeting, and found at the base of the umbel two green bodies, which appeared to be very greatly reduced and aborted inflorescences. The linear segments which formed part of these abortions probably represented perianth pieces, the terminal knob on each possibly representing the epipetalous stamen. At the base of these segments, arranged indefinitely owing to the distortion of the placenta, were numerous sessile bodies, probably representing ovules. Mr. Crawshay showed drawings in illustration of his report (fig. 67, A_1, A_2, A_3 are from the reduced inflorescence A, the remainder from B).

Malformed Cypripedium.—From Lord Avebury, P.C., came malformed specimens of *Cypripedium barbatum*. One flower showed the

anterior sepals completely divided. They were referred to Mr. Crawshay for examination (see below).

Scientific Committee, March 8, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and fifteen members present.

Scale on Alder.—Mr. Newstead, A.L.S., reported that the scale insect on the stem of Alder shown from Mr. Lynch was *Aspidiotus salicis*.

Fungus on Saxifraga.—Mr. Chittenden, F.L.S., reported that he had examined the *Saxifraga longifolia* sent by Mr. Farrer, and found it to be attacked by the rust fungus, *Puccinia Saxifragae*. This fungus attacks several species of Saxifrage, but appears to be rather uncommon in Britain.

Hyacinth bulbs failing.—Mr. Michael, F.L.S., reported that he had failed to find any bulb mites on the Hyacinth bulbs submitted to him. He thought the death of the roots had, in all probability, been caused by excess of moisture soon after they were formed.

Malformed Cypripediums.—Mr. L. Crawshay showed drawings illustrating the malformations shown in the twin-flowered inflorescence

Fig. 68.—Diagrams of abnormal flowers of Cypripedium barbatum.

of *Cypripedium barbatum* from Lord Avebury exhibited at the last meeting. He remarked that the two-flowered scape had branched about the middle. The terminal flower (fig. 68, A) had a complete perianth except the labellum, which was absent, its only indication being a median streak in the anterior sepal. The column was formed of two normal anthers and two staminodes, the stigmatic plate being absent and its place occupied by the anterior staminode. The ovary contained two placentas placed opposite to one another. The lateral flower (fig. 68, B) was normal in every way except in the trimerous outer whorl of the perianth, which showed reversion to the primitive type, the three segments being divided to the base. The ovary contained only one placenta, placed anteriorly.

Pigments in Bean seeds.—Mr. E. A. Bunyard, having examined the pigments in the seeds of the Beans shown on January 11, wrote saying that they exhibited seven distinct tints of brown, two shades of green, one black, and one blue-black.

"All the tints of brown are due to one pigment, which is insoluble in carbon bisulphide water, alcohol, ether, acids, and alum, but soluble in an aqueous solution of ammonia. A flocculent precipitate is thrown down from this solution by acetate of lead, and a strong black colour formed when treated with ferrous sulphate.

It seems probable, therefore, that the pigment is a tannin, but the small amount of material renders it impossible to affirm this with any accuracy. It is apparent that they are merely quantitative differences of the same pigment. The Beans are referred to under numbers, as No. 1, etc.; the colours (*Code des Couleurs*) as C. 100, etc.

Bean No. 1 is, for instance, a near approach to C. 107, and the pigment, in a state of purity, would probably be between the 'standard colours' Nos. C. 101 and 126.

Nos. 9, 6, 3 are closely matched by C. 107, 113, 143 respectively, and the parent Beans show the pigment much diluted in C. 128 D.

No. 8 has, however, a distinct green tinge. In this, microscopical examination reveals the pigment in a finely granulated condition, which causes, of course, greater light absorption than when in a liquid or semi-liquid condition. C. 167 gives this tint well.

No. 2 might at first be considered black, but a careful examination reveals its greenish hue, due to a large amount of the same pigment, also very finely granulated. No. 11, an apparent black, reveals the same condition. The colour in these two cases is soluble in ammonia, and gives a solution identical with that extracted from No. 1.

The only other case I have met where a yellow pigment strongly concentrated gives an appearance of black is the case of *Coelogyne pandurata*, in which the black lines are formed of highly concentrated yellow pigment.

Nos. 8, 2, and 11, in which the pigment is much granulated, is paralleled by the dark chocolate varieties of Sweet Peas. In these the anthocyan sap is deposited in dense granules instead of being in liquid form, and the very dark shades are thus produced.

No. 10 is of a blue-black tint, not represented in the Code, and is due to a strong concentration of an anthocyan pigment. The well-known dwarf Bean 'Negro Largo' is coloured with the same pigment. The limited material made it impossible to ascertain in which division of the anthocyans it should be placed."

Wood alleged to prevent iron rusting.—Mr. Holmes, F.L.S., reported that he had examined the wood shown by Dr. Voelcker, and found it to be from a Coniferous tree which Mr. Herbert Stone, F.L.S., suggested might be an *Agathis*; he had not seen it before, however. Mr. Holmes could suggest no reason why a decoction of the wood should prevent rusting. It appears to contain resin, but that is in-

soluble in water. It is certainly not the wood of *Machilus Thunbergii*, as has been suggested, for that belongs to the *Lauraceae*.

Algae in water tank.—Dr. Voelcker showed some small, rather leathery, masses of Algae, which had been taken from a cement tank, on the sides of which they had grown. The presence of the Algae, which proved to belong to a species of *Phormidium*, rendered the water unpleasant to drink. It was suggested that the tank should be covered, as the Algae would not develop in the dark, or that a weak solution of copper sulphate should be added to the water.

Lilac sporting.—Messrs. Paul showed a white-flowered Lilac with two bunches of lilac flowers and one bunch of white at the end of one of the branches, affording a somewhat remarkable case of a white flower sporting to lilac.

This interesting occurrence may probably be explained on the basis that white Lilac is—as is the case with many white varieties of *Primula sinensis*—a dominant white. That is, that it is carrying colour which is prevented from showing owing to the presence of an inhibiting factor. The reappearance of the Lilac colour is to be attributed to segregation in the bud, of dominant white character from colour character, the latter only being represented in the coloured flowers.

Malformed Beech.—Mr. Fawcett, F.L.S., showed a branch of a Beech from Tunbridge Wells having several large, smooth swellings upon it. A section through one of them showed that the middle portions were quite dark brown, and that there were dark streaks in the wood. No fungus mycelium, however, could be discovered.

Suckers on Plums, etc.—Mr. Fraser, F.L.S., showed specimens illustrating the development of suckers on Plum roots. He pointed out that the first sign of a sucker appearing is a swelling on the root. On this swelling, scale leaves, rather thick in texture, arise, and later the little bud develops into a shoot. He suggested that, in order to avoid the development of suckers, seedling Plums should be used for budding, and not suckers.

Fasciated Asparagus.—Mr. Arkwright, D.L., M.P., showed a remarkable specimen of fasciated Asparagus measuring about 2 inches across and somewhat spirally twisted. Fasciation is common in this plant, but it is seldom that such a large specimen is met with.

Rehmannia × *Briscoei* (fig. 69).—Mr. H. J. Veitch, V.M.H., showed a hybrid between *Rehmannia angulata* (of commerce) ♀ and *R. Henryi* ♂. The hybrid had been raised by Mr. Briscoe, after whom it was named. The parents were also shown, for comparison. The hybrid was in most characters intermediate between its parents, being dwarfer than *R. angulata* (of commerce), but having an erect inflorescence instead of a condensed one, as in the pollen parent. The flowers were intermediate in colour and of a pleasing soft pink. The leaves were arranged in a rosette, and were similar in shape to those of *R. Henryi*, and had the same dark veinings, while they were much more velvety-hairy than those of *R. angulata*, though a little less so than those of *R. Henryi*.

Fig. 69.—Rehmannia × Briscoei. (*Gardeners' Chronicle.*)

On the motion of Mr. Michael, seconded by Mr. Crawshay, a Botanical Certificate was unanimously recommended for *Rehmannia Henryi* (fig. 70), now for the first time exhibited, and on the motion of Mr. R. Hooper Pearson, seconded by Mr. Bennett-Poë, a Certificate of Appreciation was unanimously recommended to Messrs. James Veitch for work in connection with the raising of the interesting hybrid.

Hybrid Strelitzia.—Mr. Hill remarked that a hybrid, intermediate in character between its parents, was now flowering at Kew. It had been raised by Mr. Dallimore, between *Strelitzia Augusta* and *S.*

Fig. 70.—Rehmannia Henryi. (*Gardeners' Chronicle.*)

Reginae, and, whilst it had leaves similar to those of *S. Augusta*, it was only about 1 foot high.

Seedlings from Amaryllis.—Mr. Hudson, V.M.H., showed two seedlings from an *Amaryllis* which had been pollinated with pollen from *Vallota purpurea*. They did not show in any essential point the characters of *Vallota*, and it was suggested that the flowers should be self-pollinated and seedlings raised from them, to see whether the next generation showed any segregation in the direction of *Vallota*.

Scientific Committee, March 22, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and sixteen members present.

Algae in water-trough.—Dr. Voelcker reported that the alga which he showed at the last meeting had been identified at Kew as *Phormidium laminosum*, and that treatment with copper sulphate at the rate of one part in 5,000,000 of water had proved effective in killing it.

Cyclamen latifolium.—Mr. A. W. Sutton, V.M.H., sent two plants of *Cyclamen latifolium* for comparison with others recently shown, grown from corms collected by him in Palestine. He remarked that young corms are very difficult to obtain, because they are almost always deeply embedded in the crevices of the rocks, and it is only the large and overgrown roots that one is able to get without much trouble, with the result that the flowers then are not so large as they would be on younger plants. The majority of the Cyclamen he had seen in Syria are white with red base, but he had also seen self-coloured reds of various shades and often considerably larger than those shown.

Branching of mid-ribs.—Mr. Bowles showed, on behalf of Canon Ellacombe, a leaf of *Carpenteria californica* having the mid-rib forking at about one-third from the base. He also showed a flower of *Iris reticulata* from his own garden exhibiting a similar phenomenon.

Primula Maximowiczii (fig. 71).—Messrs. J. Veitch sent *P. Maximowiczii*, which had been obtained from West China at an altitude of 9,000 feet, and was now seen for the first time in cultivation. The elliptic-oblong leaves, with small teeth along their edges, are about 2 to 3 inches long, quite glabrous and without farina, and form a rosette. The scape, about 10 inches tall, bears many flowers, arranged verticillately as in *P. japonica*, having long, narrow, triangular bracts. The calyx is campanulate and about half the length of the corolla tube. The corolla is dark, clear purple, and has the lobes reflexed. On the motion of Sir J. Llewelyn, seconded by Mr. Douglas, V.M.H., a Botanical Certificate was unanimously recommended for the plant.

Monoecious Salix.—Mr. Bowles showed branches of *Salix cinerea* from Myddelton House, Waltham Cross, bearing both male and female catkins. Mr. Fraser, F.L.S., said the pistils appeared to be metamorphosed stamens. He had seen a somewhat similar condition before in *S. aurita* in several successive years.

Seedling Violas.—A number of flowers of a seedling of *Viola hirta* from Devon, sent by W. P. Stark, Esq., Basingstoke, were shown. Their appearance suggested the probability of their being hybrids with one of the garden forms.

Pritzel's "Iconum Botanicarum Index."—Mr. Elwes, F.R.S., brought forward the question of the issue of a new edition of Pritzel's *Iconum Botanicarum Index locupletissimus*, which had been referred to in the Annual Report of the Council. He suggested that it was a matter that the Society might itself undertake with great benefit to

horticulture, and he moved a resolution in the following terms, which was seconded by Mr. Douglas, V.M.H., and carried *nem. con.* and ordered to be sent to the Council: "That, in the opinion of the Scientific Committee, it is highly desirable in the interests of British horticulture

Fig. 71.—Primula Maximowiczii. (*Gardeners' Chronicle.*)

that a new edition of Pritzel's *Iconum Botanicarum Index locupletissimus* should be published as soon as possible under the auspices and at the expense of the Society unless a German edition is actually in prospect; and they suggest that a sub-committee should be appointed to go into the question of the probable cost, etc."

Scientific Committee, April 5, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with eleven members present, and Rev. J. Jacob, visitor.

Monoecious Willow.—Mr. Fraser, F.L.S., reported as follows on the specimen of *Salix cinerea*, bearing both male and female catkins, shown at the last meeting. In the female catkins the normal two stamens of the flowers were represented by two imperfect ovaries, the pedicels of which were 7 mm. to 8 mm. long, and corresponded with the two filaments, and the ovaries 3·5 mm. long, and corresponded with the anthers. The pistil was open on one side, so as to expose the two ovules, and was separable into two carpels, with a short style and undivided stigma to each. The ovule, without the funiculus, appeared perfect, except that the parachute was absent. Each of the two carpels had a short placenta near the base, each bearing one ovule, the placenta and ovule being marginal and exposed. Below the middle of the ovary were the two contiguous cells of the anther, about the normal length, but without pollen. In the abnormal male catkins the filaments were hairy at the base only, and were normal; the anther-cells sometimes three instead of four; the connective dilated between the cells and elongated above the anther, often separated into two and terminating in a stigma each, partly papillose, and capable of retaining pollen. The pollen grains were often smaller than those of normal flowers, and in very small quantity.

Mr. Crawshay exhibited drawings illustrating the aberrations, and pointed out that the branches usually bore flowers of one kind only; but in one case he found the flowers in some catkins on a branch differed from those in others.

The specimen figured bore catkins of three kinds on three separate branches (fig. 72A, reduced ½). The left-hand branch bore four catkins, all male. Each flower consisted of a ciliate bract, and two stamens having thick hairy filaments terminating in a rudimentary ovary (fig. 72B, mag. 5). The middle branch (top portion cut off) bore five catkins all female. Each flower consisting of a ciliate bract, and two long-stalked ovaries well-formed and hairy (fig. 72C, mag. 5). The right-hand branch bore four catkins, differing in pairs. The two lower ones were hermaphrodite, the flowers consisting of a ciliate bract and two long-stalked ovaries, each bearing a bilocular anther (fig. 72D, mag. 5). The two upper ones were males, and contained flowers like those in fig. 72B before mentioned.

Monoecious Populus tremula.—Mr. Fraser showed catkins of *Populus tremula* containing both pistils and stamens, these being the last formed by the tree.

Many-flowered Tulips.—Rev. J. Jacob showed, on behalf of M. Bony, of Clermont-Ferrand, some pots of Tulip 'M. S. Mottet,' bearing several flowers from a bulb and branching inflorescences. This

character had been found to breed true in the seedlings, and the Committee recommended that a Certificate of Appreciation should be awarded to M. Bony in recognition of his work in proving its transmission.

Callicoma serratifolia.—Sir Daniel Morris, K.C.V.O., sent a dried specimen of this handsome tree, which he had seen growing in the

Fig. 72.—Monœcious Willow (p. xxxvii.)

Azores. It has serrate leaves, about 3 inches long, woolly below, and almost globular heads of flowers. A member of the family *Saxifragaceæ*, it is particularly remarkable in growing 50 feet to 60 feet tall. It is a native of Australia, where the early settlers called it "Black Wattle," a name usually associated with *Acacia decurrens*—quite a different

thing; and another native name is "Native Beech." Its wood is said to have a reddish tint.

Chinese plants.—Mr. G. Paul sent plants of *Ilex Pernyi* in flower (the flowers of this beautiful Chinese species prove to be hermaphrodite), *Osmanthus Delavayi*, with flowers about four times the size of those of *O. ilicifolius*, and reminding one of an *Escallonia*, and *Carrierea calycina*, figured in *Rev. Hort.*, 1896, p. 498.

Pritzel's Iconum Botanicarum Index.—The Council sent the following communication in reply to the resolution sent to them from the last meeting: "The Council having considered the resolution touching Pritzel's *Index* sent up from the Scientific Committee, desire to inform the Committee that they are in communication with the authorities of the Botanical Department at Berlin, and await a reply before taking further steps in the matter."

Opuntia in Queensland.—Professor Henslow sent the following communication which he had received from Surgeon-General Geo. Henderson, M.D., F.L.S., formerly Director of the Royal Botanic Gardens, Calcutta:—"In a communication to the Royal Horticultural Society's *Journal* for March 1910, at p. 350, I see you notice the Prickly Pear in Queensland. In the Punjab, before annexation, about 1849, this plant was a pest, and covered many miles of country. Ringhit Singh is said to have had out some of his regiments to cut it down; but that did no good, unless it were burned, for every bit of it rooted and produced more plants; but about 1845 the wild cochineal insect was introduced (by mistake, it is supposed, for the cultivated or domesticated one), and, as if by magic, it spread all over the province and destroyed the Prickly Pear, which has never given any trouble since. I can find few references to this matter in any books, but I find one letter from Sir Donald McLeod, then Mr. McLeod, Commissioner of Lucknow, at p. 265 of *Select Papers* of Agri-Horticultural Society of Punjab, 1868. The letter is dated December 1852, and merely mentions the fact that 'an extraordinary influx of this insect (cochineal) almost exterminated the plant.' I lately wrote to Sir William MacGregor, Governor of Queensland, and told him about this. The cochineal could be easily introduced, for I took two pieces of Prickly Pear covered with the insect from Teneriffe to New Zealand in 1883, simply stuck on to two nails in my cabin wall, and delivered them to Dr. Hector when I arrived. I find, in the book referred to, a few casual references to the disappearance of the plant from the Punjab, but nothing very definite. I know for certain that the plant had never given any trouble up to 1889, for I lived much in the Punjab." See also Baden-Powell's *Punjab Products* (1868), p. 194.

Scientific Committee, April 19, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

The late Mr. G. S. Saunders.—The members heard with deep regret of the death of Mr. G. S. Saunders, F.L.S., who had for many years been a regular attendant at the meetings of the Committee, and who had acted as entomological referee. It was resolved that a vote of condolence should be conveyed to Mr. Saunders's relatives, the resolution being carried by the members in silence, upstanding in their places.

A four-merous Narcissus.—Mr. Chittenden, F.L.S., showed on behalf of Mr. Murray Thompson, a flower of Narcissus 'Sir Watkin,' having eight perianth pieces, eight stamens, and a four-celled ovary with four-lobed stigma. The multiplication of parts in Narcissus flowers is frequent, but this specimen showed the multiplication very regularly.

Infertile Cineraria.—Mr. Worsley drew attention to a blue-flowered Cineraria which he found among others in his garden with the stamens developed, but containing no pollen.

Intermittent variegation.—Mr. Bowles read a communication from Canon Ellacombe concerning variegation in *Sedum Telephium*. This plant had produced leaves variegated with pink in Canon Ellacombe's garden in 1908, and a piece of the plant was placed in Mr. Bowles' garden, where, also, it was variegated. In 1909, however, in *both* gardens the shoots were wholly green, but this year again, in *both* gardens, they were coming variegated. Other examples of intermittent variegation were mentioned, most occurring when the plant in question had been placed under different conditions from that in which it generally grew, and it was considered that variegation depended largely upon the environmental conditions acting upon the plant, as well as on an innate tendency to produce variegated foliage.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 11, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Jas. Veitch, Chelsea, for a collection of Apples and Pears.

Silver Banksian Medal.

To F. Bibby, Esq., Shrewsbury (gr. Mr. J. Taylor), for Pears.

First-class Certificate.

To Apple 'William Crump' (votes, unanimous), from Earl Beauchamp, Madresfield, Malvern (gr. Mr. W. Crump). This variety

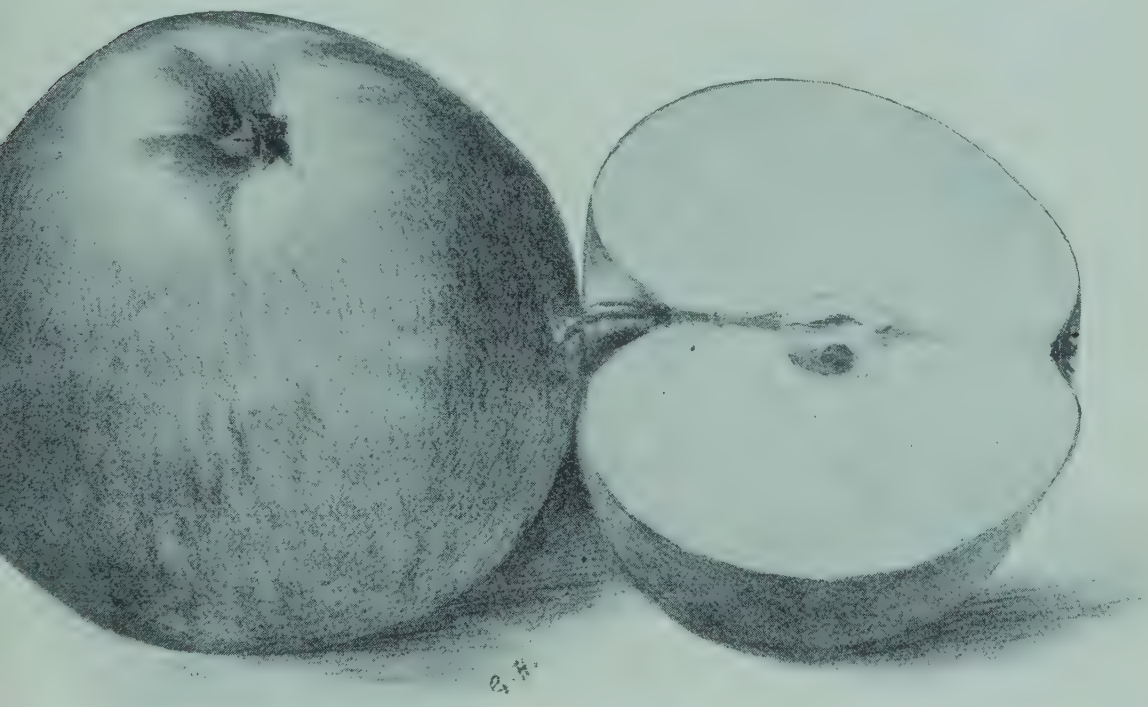


FIG. 73.—APPLE 'WM. CRUMP.' (*The Garden.*)

received A.M. December 22, 1908. (See JOURNAL R.H.S. vol. xxxiv. p. ccliv.) (Fig. 73.)

Other Exhibits.

F. Dunston, Esq., Salisbury: Apples.

Messrs. Laxton, Bedford: Apples.

Mr. G. H. Mould, Bourne, near Cambridge: Apple, 'Invader.'

FRUIT AND VEGETABLE COMMITTEE, JANUARY 25, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Medal.

To Mrs. Bischoffsheim, S. Audley Street, W., for Grapes.

Other Exhibits.

Messrs. Fowler, Lee, Reading: fruit-bottling appliances.
Mrs. S. Miller, Marlow: chutneys, jellies, &c.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 8, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. G. Bunyard, Maidstone, for fruit.
To Mrs. Denison, Berkhamsted, for root-crops.

Silver-gilt Banksian Medal.

To Messrs. Dobbie, Rothesay, for Potatos.

Silver Knightian Medal.

To Messrs. Rivers, Sawbridgeworth, for Oranges.

Silver Banksian Medal.

To Messrs. Sutton, Reading, for Leeks and Onions.

Cultural Commendation.

To Mrs. Denison, Berkhamsted, for Potatos.

Other Exhibits.

Lady Cowper, Panshanger, Hertford: Brussels Sprouts.
Messrs. Fowler, Lee, Reading: fruit-bottling appliances.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 22, 1910.

Mr. A. H. PEARSON in the Chair, and nineteen members present.

Awards Recommended:—

Silver Banksian Medal.

To Mr. W. Poupart, Twickenham, for bottled fruits.

Cultural Commendation.

To R.H.S. Gardens, Wisley (supt. Mr. S. T. Wright), for Leeks
To Messrs. Sutton, Reading, for Broccoli.

Other Exhibits.

Mr. F. W. Church, Ware: Apple, 'Campbell's Seedling.'
Messrs. Fowler, Lee, Reading: bottled fruits.
Mrs. S. Miller, Marlow: Preserves.

FRUIT AND VEGETABLE COMMITTEE, MARCH 8, 1910.

Mr. J. CHEAL in the Chair, and eighteen members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Sutton, Reading, for Kales.

FRUIT AND VEGETABLE COMMITTEE, MARCH 22, 1910.

Mr. G. BUNYARD in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for early vegetables.

Silver Banksian Medal.

To Messrs. J. Veitch, Chelsea, for salads and early vegetables.

FRUIT AND VEGETABLE COMMITTEE, APRIL 5, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Banksian Medal.

To F. E. Wienholt, Esq., Inyanga, Rhodesia, for Apples.

Cultural Commendation.

To Messrs. Sutton, Reading, for Cabbages.

To the "Times" Experimental Station, Guildford (director Mr. C. Foster), for Brussels Chicory.

Other Exhibits.

The Earl of Clarendon, Watford: Lettuces.
Messrs. Ireland, Barnstaple: Apples.
Mr. H. Jumper, Barnet: Apples.
Mr. W. Peter, Leatherhead: Apples.

FRUIT AND VEGETABLE COMMITTEE, APRIL 19, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Jas. Veitch, Chelsea, for a collection of vegetables.

Award of Merit.

To Apple 'Wagener' (votes, unanimous), from Earl Beauchamp, Madresfield Court (gr. Mr. W. Crump). Fruit of medium size, flattish-round, uneven in outline, skin bright red where exposed, yellow on the shaded side; eye partly open, set in a shallow basin; stalk thin, nearly one inch long, set in a rather deep depression; flesh crisp and of first-rate quality when cooked. Tree vigorous and prolific.

Cultural Commendation.

To Mrs. Bischoffsheim, Stanmore, for Potatos and Lettuces.

Other Exhibits.

Sir Mark Collet, Bart., Sevenoaks: Apples, &c.

Mr. T. E. Dawes, King's Lynn: Rhubarb, 'Dawes' Challenge.'

FLORAL COMMITTEE.

JANUARY 11, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. May, Edmonton, for filmy ferns.

To the Marquis of Salisbury, Hatfield, for stove plants.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. Cutbush, Highgate, for Carnations, &c.

To Messrs. J. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. S. Low, Enfield, for Carnations.

Bronze Flora Medal.

To Messrs. Cannell, Swanley, for Begonias and Pelargoniums.

Award of Merit.

To *Erlangea tomentosa* (votes, 13 for), from Messrs. J. Veitch, Chelsea. Leaves mostly opposite, lanceolate, serrate, tomentose; flowers in terminal cymes, pale blue, much resembling a *Eupatorium*. A native of British East Africa. (Fig. 74.)

Other Exhibits.

Messrs. Barr, Covent Garden: alpines.

Duchess of Bedford, Rickmansworth: Primulas.

Messrs. Bees, Liverpool: Primulas.

F. H. Chapman, Esq., Rye: Freesias.

Misses Hopkins, Shepperton: alpines.

W. Johnston, Esq., Redhill: *Lachenalia pendula*.

Messrs. Peed, Streatham: alpines, &c.

Mr. G. Reuthe, Keston: hardy plants.

Messrs. Sander, St. Albans: *Lilium nepalense*, Sander's var.

Mr. A. Young, Oxted: Begonia 'Patrie.'

FLORAL COMMITTEE, JANUARY 25, 1910.

Mr. H. B. MAY in the Chair, and twenty-three members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. May, Edmonton, for ferns and flowering plants.

FIG. 74.—ERLANGEA TOMENTOSA. (*Gardeners' Chronicle.*) (p. v.)

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations, Irises, &c.
To Messrs. S. Low, Bush Hill Park, for Carnations and Cyclamen.
To Mr. L. R. Russell, Richmond, for Azaleas, Bertolonias, &c.
To Messrs. J. Veitch, Chelsea, for Azaleas, &c.
To Messrs. T. S. Ware, Feltham, for foliage plants and alpines.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

Other Exhibits.

Messrs. Barr, Covent Garden: alpines, &c.
Messrs. Cannell, Swanley: Primulas.
Mr. F. H. Chapman, Rye: Freesias, &c.
Misses Hopkins, Shepperton: alpines, &c.
Messrs. Peed, Streatham: alpines, &c.
Mr. G. Reuthe, Keston: alpines, &c.

FLORAL COMMITTEE, FEBRUARY 8, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and thirty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. H. B. May, Upper Edmonton, for epiphytic ferns.
To Messrs. J. Veitch, Chelsea, for miscellaneous flowering plants.

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. S. Low, Bush Hill Park, for Australian plants, and Carnations.
To Messrs. W. Paul, Waltham Cross, for Camellias.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for alpines.
To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. G. Reuthe, Keston, for Rhododendrons.

Bronze Flora Medal.

To Mr. L. R. Russell, Richmond, for miscellaneous flowering plants.

Award of Merit.

To *Crinum purpurascens* (votes, 26 for), from Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., Burford, Dorking (gr. Mr. Bain). Leaves

FIG. 74.—ERLANGEA TOMENTOSA. (*Gardeners' Chronicle.*) (p. xlv.)

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations, Irises, &c.
To Messrs. S. Low, Bush Hill Park, for Carnations and Cyclamen.
To Mr. L. R. Russell, Richmond, for Azaleas, Bertolonias, &c.
To Messrs. J. Veitch, Chelsea, for Azaleas, &c.
To Messrs. T. S. Ware, Feltham, for foliage plants and alpines.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

Other Exhibits.

Messrs. Barr, Covent Garden: alpines, &c.
Messrs. Cannell, Swanley: Primulas.
Mr. F. H. Chapman, Rye: Freesias, &c.
Misses Hopkins, Shepperton: alpines, &c.
Messrs. Peed, Streatham: alpines, &c.
Mr. G. Reuthe, Keston: alpines, &c.

FLORAL COMMITTEE, FEBRUARY 8, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and thirty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. H. B. May, Upper Edmonton, for epiphytic ferns.
To Messrs. J. Veitch, Chelsea, for miscellaneous flowering plants.

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. S. Low, Bush Hill Park, for Australian plants, and Carnations.
To Messrs. W. Paul, Waltham Cross, for Camellias.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for alpines.
To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. G. Reuthe, Keston, for Rhododendrons.

Bronze Flora Medal.

To Mr. L. R. Russell, Richmond, for miscellaneous flowering plants.

Award of Merit.

To *Crinum purpurascens* (votes, 26 for), from Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., Burford, Dorking (gr. Mr. Bain). Leaves

many. 1 foot to 2½ feet in length, linear, undulate; scape about 1 foot high, purple, bearing about ten flowers in an umbel; perianth-pieces

Fig. 75.—Crinum purpurascens. (*Gardeners' Chronicle.*)

lanceolate, about 4 inches long, white, tinged on the outside with pale purple. This species requires an intermediate temperature. (Fig. 75.)

Other Exhibits.

Messrs. Barr, Covent Garden: hardy plants.
Messrs. Cannell, Swanley: Primulas.
F. H. Chapman, Esq., Rye: Freesias.
Lady Church, Hatfield: Cyclamen.
Misses Hopkins, Shepperton: hardy plants.
Mr. W. Palmer, Andover: Primulas.
Messrs. Peed, Streatham: alpines.
Messrs. Sutton, Reading: Cyclamen.
Hon. J. Ward, Hungerford: Carnations.
Messrs. T. S. Ware, Feltham: alpines.

FLORAL COMMITTEE, FEBRUARY 22, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-nine members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for forced shrubs and Cyclamen.

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for Azaleas, &c.
To Miss Gundry, Foots Cray, for flower studies in water-colour.
To Messrs. Hill, Edmonton, for ferns.
To W. Seward, Esq., Hanwell, W., for Cyclamen.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
To Messrs. May, Edmonton, for ferns.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Mr. R. E. Gill, Falmouth, for Rhododendrons.
To Messrs. S. Low, Bush Hill Park, for Cyclamen, Carnations, &c.
To Messrs. W. Paul, Waltham Cross, for Camellias.
To Mr. L. R. Russell, Richmond, for forced shrubs.
To Messrs. Sutton, Reading, for Primulas and Hyacinths.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, London, for hardy plants.
To Messrs. Carter, High Holborn, for alpines.
To Messrs. Cheal, Crawley, for hardy plants.
To Messrs. Mount, Canterbury, for Roses.
To Mr. G. Reuthe, Keston, for alpines.

Award of Merit.

To Carnation 'Mrs. Tatton' (votes, 20 for), from Mr. H. Burnett, Guernsey. A tree variety with large flowers, of good form. The base of the petal is deep pink, shading to almost white at the edge; calyx

good. This flower reminds one of 'Marmion,' but it is smaller, and the flowers are borne on long, stiff stems.

To *Fritillaria imperialis* var. *chitralensis* (votes, unanimous), from Miss Watson, Finchampstead. This is a new variety of the Crown Imperial from Chitral, where it grows in great abundance. Judging from the specimens shown, it does not produce so many flowers as the

Fig. 76.—Fritillaria imperialis var. chitralensis.

type. The perianth-pieces are less spreading. The flowers are bright yellow, sometimes faintly veined inside with brownish green. (Fig 76.)

Cultural Commendation.

To Mr. J. Douglas, Great Bookham, for *Primula megaseaefolia*.

Other Exhibits.

H. S. Barton, Esq., Liphook: Freesias.
Messrs. Brooks, Basingstoke: Primulas.

Messrs. Cannell, Swanley: Pelargoniums.
F. H. Chapman, Esq., Rye: Irises.
Messrs. Clark, Dover: alpines.
The Craven Nursery, Clapham, Lancs.: alpines.
Guildford Hardy Plant Nursery: alpines, &c.
Messrs. Heath, Cheltenham: alpines.
Messrs. Jackman, Woking: alpines.
Messrs. Peed, Streatham: alpines, &c.
J. Strange, Esq., Sulhampstead: Cyclamen.
Messrs. Ware, Feltham: alpines.

FLORAL COMMITTEE, MARCH 8, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and thirty members present.

Awards Recommended:—

Gold Medal.

To Sir E. Hambro, K.C.V.O., Hayes, Kent (gr. Mr. J. Grandfield), for alpines, &c.

Silver-gilt Flora Medal.

To Mr. L. R. Russell, Richmond, for forced shrubs.
To Messrs. J. Veitch, Chelsea, for forced shrubs, Hyacinths, &c.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations, hardy plants, &c.
To Messrs. Sutton, Reading, for Hyacinths.
To Messrs. R. Wallace, Colchester, for alpines.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Carter, Holborn, for alpines and bulbous plants.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. W. H. Page, Hampton, for Carnations, Lilies, &c.
To Messrs. G. Paul, Cheshunt, for Lilacs and Pelargoniums.
To Mr. G. Reuthe, Keston, for alpines, &c.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, London, for hardy plants.
To Messrs. S. Low, Enfield, for Carnations.
To Messrs. May, Upper Edmonton, for Clematis, &c.

Bronze Flora Medal.

To Mr. R. E. Gill, Falmouth, for Rhododendrons.
To Messrs. Mount, Canterbury, for Roses.
To Messrs. W. Paul, Waltham Cross, for Camellias.
To Messrs. T. S. Ware, Feltham, for hardy plants.

Award of Merit.

To Rose 'Lady Hillingdon' (votes, unanimous), from Messrs. Low & Shawyer, Uxbridge. Flowers of good form, deep orange-yellow. This is a Tea variety, admirably adapted for forcing.

To *Saxifraga scardica obtusa* (votes, 21 for), from Sir E. Hambro, K.C.V.O., Hayes. Flowers white, about ½ inch across; leaves tufted, glaucous, somewhat wider and larger than in *S. scardica*.

To *Shortia uniflora grandiflora* (votes, unanimous), from Sir E. Hambro. A variety of *S. uniflora*, with very much larger flowers, and

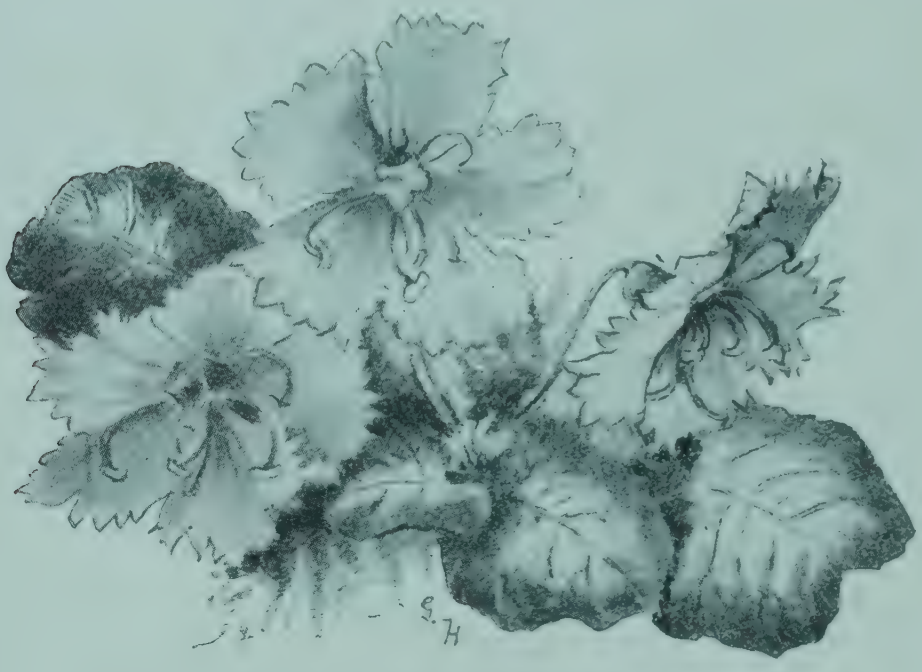


FIG. 77.—SHORTIA UNIFLORA GRANDIFLORA. (*The Garden.*)

very freely produced. The pale pink flowers look exceedingly well against the shining green and red leaves. (Fig. 77.)

Cultural Commendation.

To Sir E. Hambro, for *Saxifraga Boydii.*

Other Exhibits.

Messrs. Bakers, Codsall: hardy plants.
Messrs. Bees, Liverpool: Primulas.
Messrs. Brooks, Basingstoke: Primulas.
Messrs. Cannell, Swanley: Cacti.
F. H. Chapman, Esq., Rye: bulbous plants.
Messrs. Cheal, Crawley: hardy plants.
Messrs. Clark, Dover: hardy plants.
Dr. Codd, Bromley: *Primula* 'Pioneer.'
Mr. C. Elliott, Stevenage: alpines.
R. Fox, Esq., Falmouth: *Rhododendron Werei*
Guildford Hardy Plant Nursery: alpines.

Messrs. Heath, Cheltenham: alpines.
Misses Hopkins, Shepperton: alpines.
Messrs. Peed, Streatham: alpines, &c.
Mrs. Penton, 9, Cavendish Square, W.: Violets.
Colonel Petre, Norwich: Carnation 'Sonia.'
Mr. W. Profittlich, Twickenham: Lilies of the Valley.
L. de Rothschild, Esq., Acton: *Amaryllis* 'Amval.'
Mr. W. Watts, St. Asaph: Primroses.

FLORAL COMMITTEE, MARCH 22, 1910.

Mr. H. B. MAY in the Chair, and twenty-nine members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for Primulas, Hippeastrums, &c.

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
To Mr. W. H. Page, Hampton, for Lilies, Carnations, &c.
To Messrs. Rochford, Broxbourne, for Roses and ferns.

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.
To Messrs. S. Low, Bush Hill Park, for Carnations, &c.
To Mr. L. R. Russell, Richmond, for forced shrubs.

Silver Flora Medal.

To Mrs. Bischoffsheim, South Audley Street, W., for Roses.
To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Carter, High Holborn, for alpines.
To Messrs. Felton, Hanover Square, W., for Roses.
To R. B. Leech, Esq., Dulwich, for seedlings of *Anthurium Scherzerianum*.
To Messrs. May, Edmonton, for ferns, &c.
To Messrs. Mount, Canterbury, for Roses.
To A. E. Speer, Esq., Esher, for flower diagrams in water-colour.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants.
To Messrs. G. & A. Clark, Dover, for alpines.
To F. Galsworthy, Esq., Chertsey, for flower studies in water-colour.
To Mr. R. E. Gill, Falmouth, for Rhododendrons.
To Messrs. Jackman, Woking, for hardy plants.
To Messrs. G. Paul, Cheshunt, for Rhododendrons.
To Messrs. W. Paul, Waltham Cross, for flowering trees.
To Messrs. T. S. Ware, Feltham, for hardy plants.

FIG. 78.—RHODODENDRON PRIMULINUM. (*Gardeners' Chronicle.*)

Award of Merit.

To Carnation 'R. F. Felton' (votes, 19 for, 1 against), from Mr. H. Burnett, Guernsey. Flowers large, of good form and substance; petals broad, slightly indented; colour rich pink, much resembling the variety 'Mrs. H. Burnett.' The calyx is decidedly weak.

To *Rhododendron primulinum* (votes, 19 for), from Messrs. J. Veitch, Chelsea. A new evergreen species from China, collected by Mr. E. H. Wilson. Leaves ovate-oblong, coriaceous, about ½ inch long, margin recurved, dark green above, paler beneath; flowers about 1 inch across, borne in clusters on the ends of the shoots, pale primrose-yellow; petals undulate; filaments somewhat hairy. (Fig. 78.)

Other Exhibits.

Messrs. Bakers, Codsall: alpines.
Messrs. Bide, Farnham: Violets.
Messrs. Cannell, Swanley: Begonias.
Messrs. Carter Page, London, E.C.: Annuals, &c.
Messrs. Cheal, Crawley: alpines.
Messrs. Gilbert, Bourne, Lincs.: Anemones.
Guildford Hardy Plant Nursery: alpines.
Misses Hopkins, Shepperton: alpines.
Messrs. Jarman, Chard: Cinerarias.
Sir Trevor Lawrence, Bart., K.C.V.O., Burford: *Calathea crocata* (F.C.C. Feb. 8, 1881, under name *Maranta crocata*).
Messrs. Peed, Streatham: Lachenalias.
Mr. G. Prince, Oxford: Roses.
Mr. G. Reuthe, Keston: alpines, &c.
Mr. W. P. Stark, Basingstoke: Violets.

FLORAL COMMITTEE, APRIL 5, 1910.

Mr. H. B. MAY in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for Cinerarias and forced shrubs.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
To Mr. G. Prince, Oxford, for Roses.
To Mr. L. R. Russell, Richmond, for forced shrubs.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. S. Low, Bush Hill Park, for Carnations, &c.
To Messrs. H. B. May, Edmonton, for Roses, &c.
To Mrs. W. H. Page, Hampton, for Carnations, Lilies, &c.

To Capt. A. Dorrien-Smith, Banbury, for photographs illustrating the Flora of Chatham Is., N.Z.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for Begonias and zonal Pelargoniums.
To Mr. C. Engelmann, Saffron Walden, for Carnations.

FIG. 79.—AURICULA 'PHYLLIS DOUGLAS.' (*The Garden.*)

To Mr. R. E. Gill, Falmouth, for Rhododendrons.
To Messrs. Mount, Canterbury, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. R. Wallace, Colchester, for hardy plants.

Award of Merit.

To Auricula 'Phyllis Douglas' (votes, 14 for), from Mr. J. Douglas, V.M.H., Great Bookham. A white-centred Alpine variety, with large flowers of perfect form and much substance; colour deep violet-purple, beautifully shaded to the pale edge. (Fig. 79.)

To Cineraria 'Feltham Beauty' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A fine strain of the 'Stellata' type. Plants of very compact habit, producing in great abundance flowers 1½ inch across, including all shades found in Cinerarias.

To *Lonicera pileata* (votes, 18 for, 1 against), from Messrs. G. Paul, Cheshunt. This is a recent introduction from China, and has proved quite hardy. Leaves opposite, sessile, broadly lanceolate, obtuse, about ¾ inch long; flowers in axillary pairs, pale cream, slightly scented.

Other Exhibits.

Messrs. Bakers, Codsall: hardy plants.
Messrs. Barr, Covent Garden: hardy plants.
Messrs. Carter Page, London, E.C.: Violas, &c.
Messrs. Clark, Dover: hardy plants.
B. Cresswell, Esq., Longfield: Pelargonium.
Mr. J. Douglas, Great Bookham: Auriculas.
Mr. C. Elliott, Stevenage: alpines.
Mr. H. Ellison, West Bromwich: *Dracaena Bruantii.*
Messrs. Gilbert, Bourne, Lincs.: Anemones.
Guildford Hardy Plant Nursery: alpines.
Messrs. Heath, Cheltenham: alpines.
Misses Hopkins, Shepperton: alpines.
Messrs. Jackman, Woking: hardy plants.
Mr. P. Ladds, Swanley: Stocks.
Sir Trevor Lawrence, Bart., K.C.V.O., Burford: *Cineraria* 'Matador.'
Mr. Fleetwood Paul, Botley: Sweet Peas.
Messrs. G. Paul, Cheshunt: Lachenalias, shrubs, &c.
Messrs. W. Paul, Waltham Cross: Roses.
Messrs. Peed, Streatham: alpines, &c.
Lieut.-Col. Taylor, Braintree: *Haemanthus insignis.*
Messrs. Ware, Feltham: hardy plants.
Miss Watson, Finchampstead: *Ixiolirion tataricum.*

Floral Committee, April 19, 1910.

Mr. H. B. May in the Chair, and thirty members present.

Awards Recommended:—

Gold Medal.

To Mr. J. Douglas, Great Bookham, for Alpine and Show Auriculas.

To Lieut.-Col. Holford, C.I.E., C.V.O., Tetbury, for Hippeastrums.

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cutbush, Highgate, for Carnations and hardy plants.

To Messrs. Felton, Hanover Square, W., for Roses and *Gerbera Jamesonii*.

To Messrs. S. Low, Bush Hill Park, for Carnations, Roses, &c.

To Mr. W. H. Page, Hampton, for Carnations, Lilies, &c.

To Messrs. Storrie & Storrie, Glencarse, N.B., for Polyanthus.

To Messrs. Sutton, Reading, for Cinerarias.

To Messrs. J. Veitch, Chelsea, for greenhouse plants, &c.

Silver Banksian Medal.

To Lady Barry, Windsor, for Camellias.

To Mrs. Bischoffsheim, South Audley Street, W., for Pelargoniums.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. May, Edmonton, for flowering plants, &c.

To Messrs. Mount, Canterbury, for Roses.

To Messrs. Peed, Streatham, for Caladiums.

To Mr. Prince, Longworth, for Roses.

To Mr. L. R. Russell, Richmond, for forced shrubs.

To Messrs. Wallace, Colchester, for hardy plants.

To Messrs. T. S. Ware, Feltham, for hardy plants.

Cultural Commendation.

To Mr. A. Chapman, gardener to Lieut.-Col. Holford, C.I.E., C.V.O., Tetbury, Glos., for Hippeastrums.

Award of Merit.

To Auricula 'Roxburgh' (votes, 17 for), from Mr. J. Douglas, Great Bookham. An alpine variety, with large flowers of very good form and substance, borne in a good truss; centre cream; colour deep violet, with a narrow paler zone at edge.

To Auricula 'Victor' (votes, unanimous), from Mr. J. Douglas. A deep crimson, show self, of good form, and with a dense white paste. Leaves green.

To Auricula 'Warley' (votes, 18 for), from Mr. J. Douglas. A show variety, of value not so much for its form as its colour, which is a delicate mauve. (Fig. 80.)

To Hippeastrum 'Calypso' (votes, unanimous), from Lieut.-Col. Holford, C.I.E., C.V.O., Tetbury, Glos. Flowers large white, with rosy scarlet lines, which are absent from the centre of each petal.

To Hippeastrum 'Cardinal Wolseley' (votes, 12 for), from Lieut.-Col. Holford. Flowers of excellent form; rosy scarlet with white in the throat.

To Hippeastrum 'Gereant' (votes, unanimous), from Lieut.-Col. Holford. Flowers bright scarlet, tinged with crimson in the throat.

To *Primula ciliata* 'General Stuart' (votes, 14 for), from W. B. Cranfield, Esq., Enfield. A very free-flowering plant with flowers $\frac{3}{4}$ inch in diameter, rosy crimson, with yellow eye. The foliage closely resembles *P. viscosa*, to which species it probably belongs.

FIG. 80.—AURICULA 'WARLEY.' (*Gardeners' Chronicle.*)

Other Exhibits.

Mrs. G. Austin, Godalming: Wallflowers.
Messrs. Bakers, Codsall: hardy plants.
Messrs. Barr, Covent Garden: hardy plants.
Herr M. E. Benary, Erfurt: Myosotis.
Messrs. Cannell, Swanley: Pelargoniums.

Messrs. Carter Page, London, E.C.: Violas, &c.
Messrs. Clark, Dover: hardy plants.
Messrs. Dobbie, Rothesay: Violas.
Mr. C. Elliott, Stevenage: hardy plants.
Messrs. Gilbert, Bourne, Lincs.: Anemones.
Guildford Hardy Plant Nursery: hardy plants.
Misses Hopkins, Shepperton: hardy plants.
Messrs. Jackman, Woking: hardy plants.
Messrs. Jones, Lewisham: Pelargoniums.
Mr. T. Kitley, Bath: *Saxifraga bathoniensis*.
H. Lewis, Esq., S. Croydon: *Saxifraga biflora alba*.
Mrs. Lloyd-Edwards, Llangollen: Saxifrages, &c.
Signor C. Lorenz, Palermo: Freesias.
Messrs. Manger, Guernsey: Anemones.
Mrs. Marshall, Ambleside: *Primula viscosa*.
C. P. Maw, Esq., Kenley: *Chionodoxa Luciliae alba*.
Messrs. W. Paul, Waltham Cross: Roses.
Mr. G. Reuthe, Keston: hardy plants.

ORCHID COMMITTEE.

JANUARY 11, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. Day), for Odontoglossums.

To Messrs. J. Veitch, Chelsea, for hybrid Cypripediums.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Stuart Low, Bush Hill Park, for a group.

To Messrs. McBean, Cooksbridge, for Cypripediums and Odontoglossums.

To Messrs. Cypher, Cheltenham, for a group.

To Mr. E. V. Low, for a group.

First-class Certificate.

To *Lycaste Skinneri armeniaca* (votes, unanimous), from Fergus Menteith Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). A charming large white flower with a slight apricot-yellow tinge on the petals and lip.

Award of Merit.

To *Cypripedium* × 'Atlas' (× 'Ceres Fascinator' × *insigne* 'Harefield Hall') (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. H. G. Alexander). Dorsal sepal white spotted with dark purple. Petals and lip honey-yellow tinged with purple, the petals bearing dark purple spots.

To *Cypripedium* × 'Bantam' (*nitens Sallieri Hyeanum* × 'Hera Euryades') (votes, unanimous), from Lieut.-Col. G. L. Holford. A wax-like flower with deep red-brown dorsal sepal with white upper half. Petals and lip yellow tinged with red-brown.

Botanical Certificate.

To *Phaius Cooperi*, from Messrs. Sander, St. Albans. Allied to *P. callosus*. Growth of *P. grandifolius*. Sepals and petals white at the back, red-brown in front. Lip tubular and continued into a spur; white blotched with rose inside; front fringed.

Cultural Commendation.

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for three fine spikes of *Habenaria Ugandae.*

Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H.: rare species.

Francis Wellesley, Esq.: *Cypripedium* × *Wellesleyae* and *C.* × *Leeanum* 'His Majesty.'

F. Menteith Ogilvie, Esq.: *Cypripedium* × 'Antigone.'

Mrs. N. C. Cookson: hybrid Cypripediums.

Messrs. Wm. Bull: *Odontoglossum crispum* 'Flora.'

J. S. Moss, Esq.: *Odontoglossum* × 'Hilda' (*Coradinei Crawshayanum* × *Pescatorei*).

Messrs. Stanley: Cypripediums.

Monsieur Mertens: Odontoglossums.

Mr. H. A. Tracy: hybrid Cypripediums.

ORCHID COMMITTEE, JANUARY 25, 1910.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, for hybrids and rare species.

To Messrs. Sander, for *Cattleya Trianaei*, &c.

To J. Forster Alcock, Esq., for Cypripediums.

To E. Rogerson, Esq., for Cypripediums.

To Messrs. J. Cypher, for a group.

Silver Banksian Medal.

To Messrs. Stuart Low, for Cattleyas and Cypripediums.

To Messrs. McBean, for Odontoglossums, &c.

To Mr. E. V. Low, for Cypripediums.

First-class Certificate.

To *Anguloa Cliftonii* (votes, unanimous), from Messrs. Charlesworth. A fine novelty with a resemblance to *A. Ruckeri*, but with lemon-yellow flowers marked with rose-purple inside. (Fig. 81.)

Award of Merit.

To *Cattleya* × 'Miranda,' Westonbirt variety (*C. Trianaei* × *C. amethystoglossa*) (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. H. G. Alexander). Flowers rose-pink with some small purple spots on the sepals, the lip having a crimson front lobe.

To *Cypripedium* × 'Lord Wolmer' (*Leeanum Clinkaberryanum* × 'Hera Euryades') (votes, unanimous), from H. J. Bromilow, Esq.,

Rainhill, Lancashire (gr. Mr. Morgan). Dorsal sepal large, white with dotted rose lines. Petals and lip yellowish tinged and marked with purple. (Fig. 82.)

Other Exhibits.

Lieut.-Col. G. L. Holford, C.I.E., C.V.O.: new hybrid *Cypripedium*.

Fig. 81.—Anguloa Cliftonii. (*Journal of Horticulture.*)

Mrs. Norman C. Cookson: *Odontioda* × *Bradshawiae*, Cookson's variety.

H. S. Goodson, Esq.: Odontoglossums.

R. G. Thwaites, Esq.: *Odontioda* × *Charlesworthii*.

Francis Wellesley, Esq.: *Cypripedium* × *Wellesleyae* (' Venus ' × *insigne* ' Harefield Hall ').

H. J. Bromilow, Esq.: rare Cypripediums.

R. Brooman White, Esq.: *Cypripedium insigne Sanderae* from seed.

FIG. 82.—CYPRIPEDIUM × 'LORD WOLMER.' (*Gardeners' Magazine.*) (p. lxii.)

Mr. A. W. Jensen: *Odontoglossum crispum* 'Irene.'

Monsieur Mertens, Ghent: Odontoglossums.

ORCHID COMMITTEE, FEBRUARY 8, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for a group.

To Messrs. Charlesworth, Haywards Heath, for a group, principally hybrids.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for Phalaenopsis and Odontoglossums.

To Messrs. Cypher, Cheltenham, for Cypripediums.

To Messrs. Stuart Low, Bush Hill Park, for Cattleyas, &c.

Silver Banksian Medal.

To E. Rogerson, Esq., West Didsbury, for hybrid Cypripediums.

To Mr. E. V. Low, Haywards Heath, for a group.

Award of Merit.

To *Cattleya Percivaliana*, Westonbirt variety (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O., Westonbirt (gr. Mr. H. G. Alexander). The largest form yet shown; equal in size to *Cattleya labiata*. Flowers bright magenta rose, lip reddish-claret colour with lilac margin.

To *Dendrobium* × 'Duchess of Albany' (*Wiganianum* × *Wiganiae xanthochilum*) (votes, 12 for, 2 against), from Sir Jeremiah Colman, Bart., V.M.H. Flowers blush-white, wax-like in texture, and very freely produced.

To *Cypripedium* × *Leeanum* 'Excelsior' (*insigne* var. × *Spicerianum*) (votes, 8 for, 4 against), from H. J. Bromilow, Esq., Rann Lea, Rainhill, Lancashire (gr. Mr. W. J. Morgan). A very large flower with broad white dorsal sepal, having dotted rose-purple lines. Petals and lip yellow tinged with red-brown.

Botanical Certificate.

To *Dendrobium arcuatum*, from Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier). A rare species from Java, bearing, on slender leafy pseudo-bulbs, sprays of four flowers. Flowers an inch across, having stout spurs curved forward at the tips, white with slight rose markings on the side lobes of the lip.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bart., V.M.H., for *Cymbidium grandiflorum* with three fine spikes.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O.: Odontoglossum × *Lawrenceanum* (*Rolfeae* × *triumphans*).

Lieut.-Col. G. L. Holford, C.I.E., C.V.O.: hybrid Orchids.

Sir Jeremiah Colman, Bart., V.M.H.: a group.

R. G. Thwaites, Esq.: white *Cattleya*.

W. M. Appleton, Esq.: *Cypripedium* × *ingens* (*insigne* × *Rothschildianum*).

Mrs. Temple: *Brassocattleya* × 'Vesta' (*B. glauca* × *C. Percivaliana*).

H. S. Goodson, Esq.: *Odontoglossum* × *Lambeauianum*, Goodson's variety.

J. J. Neale, Esq.: *Laelia* × *Lynwoodii* (*Jongheana* × *harpophylla*).

C. L. N. Ingrams, Esq.: *Dendrobium* × *intermedium*.

Monsieur Mertens: hybrid Odontoglossums.

ORCHID COMMITTEE, FEBRUARY 22, 1910.

Mr. HARRY J. VEITCH in the Chair, and twenty-four members present.

Awards Recommended:—

Gold Medal.

To Sir Jeremiah Colman, Bart., V.M.H., Gatton Park (gr. Mr. Collier), for a very fine group, including some new hybrids.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a group, principally hybrids.

To Messrs. Sander, St. Albans, for hybrid Odontoglossums, &c.

To Messrs. Stuart Low, Bush Hill Park, for Dendrobiums and Cypripediums.

Silver Banksian Medal.

To Messrs. J. Cypher, for Dendrobiums, &c.

To Messrs. Mansell & Hatcher, Rawdon, for a group.

To Messrs. McBean, Cooksbridge, for white *Laelia anceps*, Odontoglossums, &c.

To Mr. E. V. Low, Haywards Heath, for Cattleyas, Cypripediums, and Odontoglossums.

First-class Certificate.

To *Odontoglossum* × *splendens* (*eximium* × *Wilckeanum*) (votes, 17 for, 2 against), from Messrs. Sander, St. Albans. A fine flower heavily tinged and blotched with purplish chocolate, the margins of the segments being cream-white. (Fig. 83.)

Award of Merit.

To *Odontoglossum* × 'Black Prince' (*Lambeauianum* × *Rolfeae*) (votes, unanimous), from Messrs. Sander. Flowers claret with narrow silver-white margin.

To *Dendrobium* × 'Mrs. Fenton Arnton' (*melanodiscus* × *Findlayanum*) (votes, unanimous), from Sir Jeremiah Colman, Bart., V.M.H. Flowers white with a blush tint on the sepals and a purple blotch at the base of the lip.

To *Cattleya Schröderae*, 'The Prince' (votes, unanimous), from H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day). Sepals and petals peach-blossom; lip claret-purple in front. Petals and lip undulate at the margin.

Fig. 83.—Odontoglossum × splendens. (*Gardeners' Magazine.*)

To *Odontoglossum* × *eximium*, 'E. C. Rogerson' (*crispum* × *ardentissimum*) (votes, 11 for, 5 against), from E. Rogerson, Esq. (gr. Mr. W. C. Price). Closely resembling a good blotched *O. crispum*, but with indication of *O. Pescatorei* in the lip.

To *Disa lacera multifida* (votes, unanimous), from Messrs. Charlesworth. Leaves grass-like; scape erect, 1 foot, bearing six deep-blue flowers with fringed lip.

To *Odontoglossum* × 'Ceres' (*Rossii* × *Rolfeae*). Sepals and petals white tinged with sulphur-yellow at the margins, the sepals evenly spotted with red, the petals having similar spots on the inner half. Lip broad, undulate, white.

Botanical Certificate.

To *Diuris longifolia*, from Sir Jeremiah Colman, Bart., V.M.H. An Australian terrestrial species with yellow flowers tinged with purple.

Other Exhibits.

Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. Alexander): hybrid Orchids.

R. Brooman White, Esq.: *Odontoglossum crispum.*

R. G. Thwaites, Esq.: *Odontioda* × *Seymourii* (*Uro-Skinneri* × *C. vulcanica*).

W. P. Burkinshaw, Esq.: Cypripediums.

Col. Cary Batten: Cypripediums.

Monsieur Mertens: Odontoglossums.

H. S. Goodson, Esq.: Laeliocattleyas.

ORCHID COMMITTEE, MARCH 8, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-five members present.

Awards Recommended:—

Silver Flora Medal.

To Baron Sir H. Schröder, The Dell, Egham (gr. Mr. Ballantine), for a group of *Calanthe* × 'Baron Schröder.'

To H. S. Goodson, Esq., Putney (gr. Mr. Day), for a group.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, &c.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Cypher, Cheltenham, for Cypripediums and Dendrobiums.

Silver Banksian Medal.

To Messrs. Stuart Low, Bush Hill Park, for Dendrobiums, &c.

To Mr. A. W. Jensen, Lindfield, for *Cattleya Schröderae* and *Odontoglossums.*

To Mr. E. V. Low, Haywards Heath, for a group.

First-class Certificate.

To *Phaiocalanthe* × *Schröderiana* (*Phaius Wallichii* × *Calanthe* × 'Baron Schröder') (votes, unanimous), from Baron Sir H. Schröder (gr. Mr. Ballantine). Sepals and petals cream tinged with rose; lip dark claret. (Fig. 84.)

Award of Merit.

To *Laeliocattleya* × 'Goldfinch,' Westonbirt variety (*L.-c.* × *warnhamiensis* × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. Alexander). A showy hybrid with the sepals and petals old-gold tinged with rose; lip deep ruby-red.

To *Epicattleya* × 'Nebo' (*E.* × *O'Brienianum* × *C.* × *Claesiana* (votes, unanimous), from Sir Trevor Lawrence, Bart.,

Fig. 84.—Phaiocalanthe × Schröderiana. (*Journal of Horticulture.*)

K.C.V.O. (gr. Mr. W. H. White). Growth of *E.* × *O'Brienianum* but shorter. Flowers reddish-rose with white-fringed lip.

To *Odontoglossum* × *Cravenianum* (*cirrhosum* × *ramosissimum*) (votes, unanimous), from Messrs. Charlesworth. An elegant hybrid with pure white flowers spotted with purple, the segments being broader than *O. cirrhosum* and thicker in texture.

To *Cymbidium* × *Lowgrinum*, Rosslyn variety (*Lowianum* × *tigrinum*) (votes, unanimous), from H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood). Differing from those previously shown in

having reddish-brown sepals and petals, and white lip with purple markings.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O.: hybrid Dendrobiums.
Sir Jeremiah Colman, Bart., V.M.H.: rare species.
J. Gurney Fowler, Esq.: hybrid Odontoglossums.
Lieut.-Col. G. L. Holford, C.I.E., C.V.O.: new hybrids.
R. G. Thwaites, Esq.: hybrids.
G. Hanbury, Esq.: *Cymbidium.*
Messrs. Heath: Cypripediums.
Francis Wellesley, Esq.: *Cattleya Trianaei.*
Mrs. Cookson: *Odontoglossum* × *percultum* 'Clive,' and hybrid Cypripediums.
G. P. Walker, Esq.: *Dendrobium hedyosmum.*
E. Rogerson, Esq.: *Odontoglossum* × 'Lily Wilkinson.'
Monsieur Mertens: Odontoglossums.

ORCHID COMMITTEE, MARCH 22, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Sander, St. Albans, for a group.
To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, &c.
To Messrs. Stuart Low, Bush Hill Park, for a group.
To Mr. E. V. Low, Haywards Heath, for Cattleyas and Dendrobiums.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for Odontoglossums.
To Mr. A. W. Jensen, Lindfield, for Cattleyas.
To Messrs. Cypher, Cheltenham, for a group.

First Class Certificate.

To *Cattleya* × 'Robert de Wavrin,' Westonbirt variety (*Schilleriana* × *Schröderae*) (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. H. G. Alexander). A large and finely-formed flower of a pure rose colour with purplish-rose front to the lip. (Fig. 85.)

Award of Merit.

To *Laeliocattleya* × *Trimyra* (*C. Trianaei* × *L.-c.* × *Myra* (votes, unanimous), from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). Flowers several on a spike, clear cowslip-yellow. (Fig. 86.)

To *Odontoglossum* × *Thompsonianum*, Gatton Park variety (*Edwardii* × *crispum* 'Mary Colman') (votes, 9 for, 3 against), from

Fig. 85.—Cattleya × 'Robert de Wavrin,' Westonbirt var. (*Gardeners' Magazine.*)

Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier). A good form with claret-purple flowers, with lilac margins and tips to the segments.

To *Houlletia Sanderi* (votes, unanimous), from Messrs. Sander, St. Albans. Scapes stout, erect, about one foot, and bearing two to

three fleshy cream-white flowers, having some resemblance to those of the Dove Orchid (*Peristeria elata*).

To *Odontoglossum* × 'Gladys H. W. Cheal' (*cirrhosum* × *crispo-Harryanum*) (votes, unanimous), from Messrs. McBean, Cooksbridge. Flowers white tinged with yellow, and heavily blotched with dark purple.

FIG. 86.—LAELIOCATTLEYA × TRIMYRA. (*Journal of Horticulture.*) (p. lxx.)

Botanical Certificate.

To *Polystachya bracteosa*, from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). A tropical African species with flattened pseudo-bulbs, and racemes of greenish flowers marked with reddish-brown inside.

Cultural Commendation.

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for *Sarcochilus Hartmannii* with four spikes.

Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier): a group.

Fergus Menteith Ogilvie, Esq. (gr. Mr. Balmforth): the original *Odontoglossum triumphans aureum.*

W. Bolton, Esq., Warrington: *Cypripedium Maudiae* × *C. Chamberlainianum.*

Lord Onslow, Clandon Park: *Dendrobium Wardianum album.*

Sir Trevor Lawrence, Bart., K.C.V.O.: hybrid Dendrobiums, &c.

Mr. W. H. Young, Romford: *Cypripedium villosum annamense.*

Orchid Committee, April 5, 1910.

Mr. J. Gurney Fowler in the Chair, and eighteen members present.

Awards Recommended:—

Gold Medal.

To H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. Day), for a fine group including many hybrid Odontoglossums.

Silver-gilt Flora Medal.

To Messrs. Armstrong and Brown, Tunbridge Wells, for a group.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for rare species and hybrids.

To Messrs. Sander, St. Albans, for a group.

Silver Banksian Medal.

To Messrs. Stuart Low, Bush Hill Park, for Dendrobiums, &c.

To Mr. E. V. Low, Haywards Heath, for Cattleyas, &c.

First-class Certificate.

Lycaste Skinneri hellemensis (votes, unanimous), from Lieut.-Col. G. L. Holford, C.I.E., C.V.O. (gr. Mr. H. G. Alexander). Flowers large, deep rose, with a little white showing at the backs of the sepals and on the lip. (Fig. 87.)

To *Phalaenopsis casta superbissima* (votes, 12 for, 2 against), from Messrs. Sander. A fine natural hybrid with the foliage of *P. Schilleriana.* Flowers large, round, white with a delicate pink tint.

To *Odontoglossum* × *ardentissimum* 'Norman Cookson' (*Pescatorei* × *crispum Graireanum*) (votes, unanimous), from Mrs. N. C. Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman). Flowers equal in size to *O. crispum*, claret-purple with white margins to the segment. (Fig. 88.)

Award of Merit.

To *Odontioda* × *Goodsoniae* (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. Day). Flowers scarlet with white markings.

Supposed to be a hybrid of *Cochlioda Noezliana* and *Odontoglossum* × *ardentissimum*.

To *Odontoglossum* × 'Ceres,' Goodson's variety (*Rossii* × *Rolfeae*) (votes, 12 for, 1 against), from H. S. Goodson, Esq. Resembling *O. Rossii*, but of stronger growth, the flowers having a large ovate white blade to the lip.

FIG. 87.—LYCASTE SKINNERI HELLEMENSIS. (*Gardeners' Magazine.*) (p. lxxiii.)

Botanical Certificate.

To *Megaclinium triste*, from Sir Trevor Lawrence, Bart., K.C.V.O. Scapes dark-purple. Flowers chocolate-purple.

To *Megaclinium fuscum*, from Sir Trevor Lawrence, Bart., K.C.V.O. Inflorescence with a flat rachis, dark purple with minute white spots. Flowers dull brownish-purple.

To *Pleurothallis tridentata*, from Mr. Gurney Wilson. A dwarf tufted plant with brownish leaves. Flowers small, greenish.

Cultural Commendation.

To Mr. H. G. Alexander, orchid grower to Lieut.-Col. G. L. Holford, C.I.E., C.V.O., for *Odontoglossum Pescatorei*, Westonbirt variety, with an eight-branched spike of forty-five flowers.

To Mr. W. H. White, orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for *Cirrhopetalum Cumingii* with sixteen spikes.

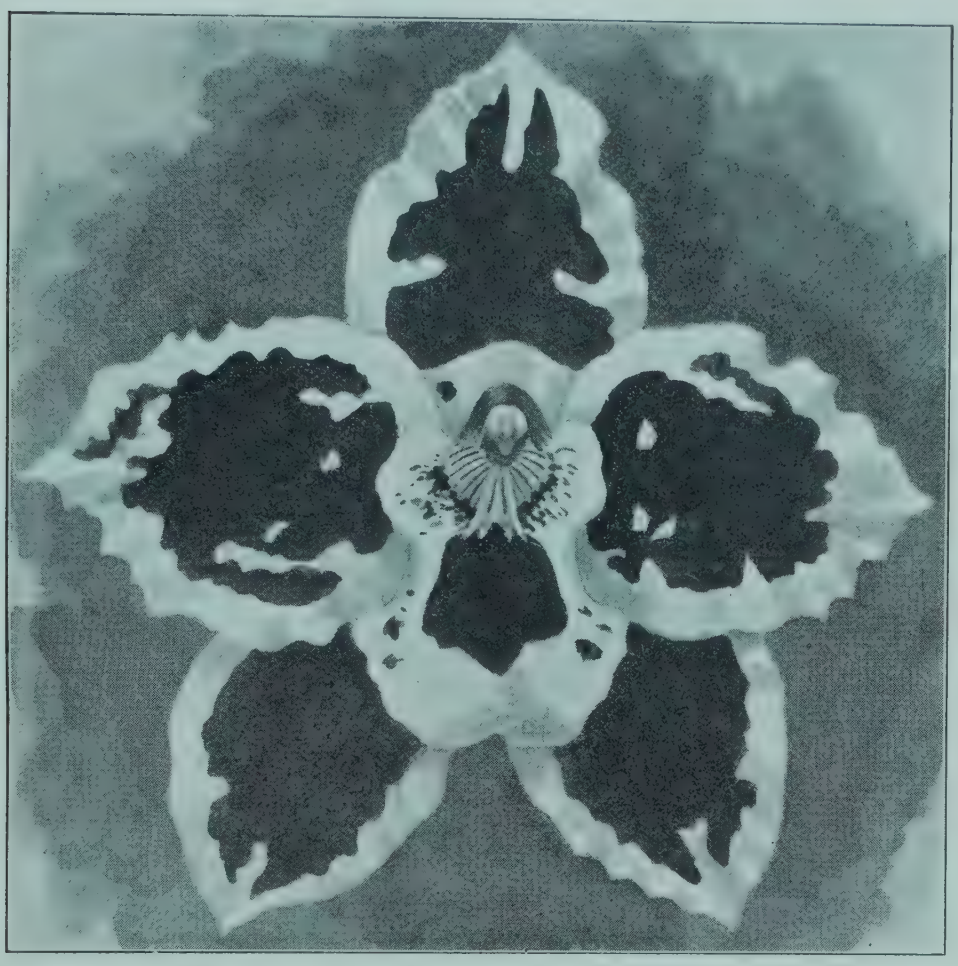


Fig. 88.—Odontoglossum × ardentissimum 'Norman Cookson.' (*Journal of Horticulture.*) (p. lxxiii.)

Other Exhibits.

Lieut.-Col. G. L. Holford, C.I.E., C.V.O.: new hybrids.

J. Gurney Fowler, Esq.: Odontoglossums.

Sir Jeremiah Colman, Bart, V.M.H.: a group.

F. Menteith Ogilvie, Esq.: *Dendrobium Thwaitesiae*, Veitch's variety.

Mrs. Temple: *Laeliocattleya* × 'Mrs. Temple.'

Mr. A. W. Jensen: Cattleyas and Odontoglossums.

Mr. Gurney Wilson: *Sophrolaeliocattleya* × *bletchleyflora.*

Sir Trevor Lawrence, Bart: rare species.

ORCHID COMMITTEE, APRIL 19, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Stuart Low, Bush Hill Park, for Dendrobiums and Odontoglossums.

Silver Flora Medal.

To Messrs. Charlesworth, for a group.

To Messrs. Sander, for a group.

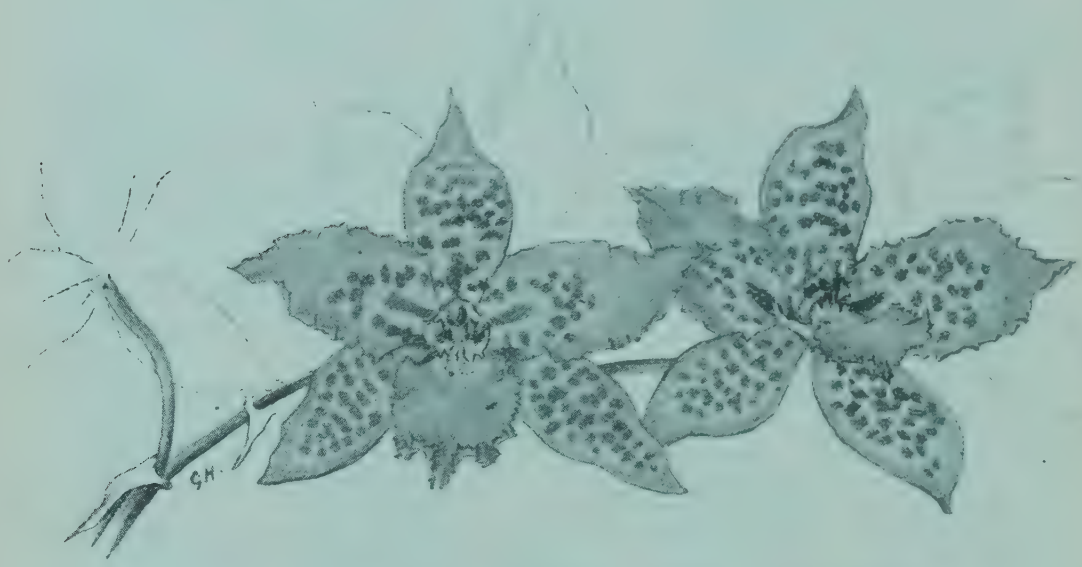


FIG. 89.—ODONTOGLOSSUM ROSSIANAE RUBENS. (*The Garden.*)

Award of Merit.

To *Odontoglossum* × *regale rosefieldiense* (*Lawrenceanum* × *ardentissimum*) (votes, unanimous), from de B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Stables). Flowers larger than *O.* × *ardentissimum*; lemon-yellow with broad bands and blotches of purple.

To *Sobralia Cliftonii* (votes, unanimous), from Messrs. Sander, St. Albans. A white-flowered variety from Ecuador. Flowers resembling *S. macrantha alba* but with a smaller lip. Disc with some purple hairs.

To *Odontoglossum* × *Arnoldianum* (parentage unknown) (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis). Sepals and petals claret colour with a few whitish markings. Lip white with yellow crest and purple blotches.

To *Odontoglossum* × *Lawrenceanum*, Cobb's variety (votes, unanimous), from Walter Cobb, Esq., Rusper (gr. Mr. Salter). A very fine variety with lemon-yellow flowers heavily blotched with claret. Lip white in front, blotched with purple at the base.

To *Miltonia Phalaenopsis*, McBean's variety (votes, unanimous), from Messrs. McBean, Cooksbridge. Flowers white, with a deep-rose mask covering the greater part of the lip.

To *Odontoglossum* × *Rossianae rubens* (*Rossii* × *Adrianae*) (votes, unanimous), from Monsieur Henri Graire, Amiens. Flower spike with six flowers, each as large as *O. Adrianae* but generally resembling *O. Rossii*. Colour lilac, with dark-purple spotting on the sepals and inner part of the petals. (Fig. 89.)

To *Odontoglossum crispum* 'St. Fuscien' (votes, unanimous), from Monsieur Henri Graire. A fine blotched variety near to *O. crispum Cooksoniae*.

Other Exhibits.

Lieut.-Col. G. L. Holford, C.I.E., C.V.O.: *Cymbidium Lowianum*, Pitt's variety.

J. Gurney Fowler, Esq.: *Brassocattlaelia* × *Fowleri*.

de B. Crawshay, Esq.: hybrid Odontoglossum.

E. Rogerson, Esq.: *Odontoglossum* × *eximium Rogersonii*.

Walter Cobb, Esq.: Odontoglossum.

Monsieur Henri Graire: Odontoglossums.

H. S. Goodson, Esq.: *Odontoglossum* × *eximium* 'Lord Carnarvon.'

Messrs. McBean: a group.

Messrs. Armstrong & Brown: a group.

H. T. Pitt, Esq.: *Cypripedium* × 'The King.'

ESTABLISHED
1804.

INCORPORATED
1809.

TELEGRAMS:
"HORTENSIA, LONDON."

TELEPHONE:
5363 WESTMINSTER.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. General.
2. Letters.
3. Telephone and Telegrams.
4. Journals Wanted.
5. Subscriptions.
6. Form of Bequest.
7. Privileges of Chemical Analysis.
8. List of Fellows.
9. New Fellows.
10. An Appeal.
11. The Society's Gardens at Wisley.
12. Trials at Wisley in 1910–11.
13. The Wisley Research Station.
14. Students at Wisley.
15. Distribution of Surplus Plants.
16. Hiring of the Society's Hall.
17. Exhibitions, Meetings, and Lectures.
18. British Fruit and Vegetables.
19. Challenge Cups for Vegetables.
20. Colonial-grown Fruit Show, 1910.
21. Shows of kindred Societies in 1910.
22. Lectures.
23. "The Masters Lectures."
24. Examinations, 1910.
25. Information.
26. Inspection of Fellows' Gardens.
27. Affiliation of Local Societies.
28. Union of Horticultural Mutual Improvement Societies.
29. Colour Chart.
30. Monograph on Fungoid Pests.
31. Alterations in Rules for Judging.
32. Spraying of Fruit Trees.
33. Varieties of Fruits.
34. List of Plants Certificated.
35. International Horticultural Exhibition, 1912.
36. Recognition of Diligent Interest in Plants.
37. "Scaly Lizard" Wanted.
38. Plant Labelling.
39. Bulb Show Prizes, 1911.
40. Advertisements.

ROYAL PATRONS.

Fellows will learn with much pleasure that their Imperial Majesties King George V. and Queen Mary have graciously consented to become Patrons of the Society.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 WESTMINSTER.**
"HORTENSIA, LONDON," is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted:—

VOLUME V. Part 1.
VOLUME X.
VOLUME XIII. Part 1.

These are therefore particularly asked for.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1st of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1st. It may be a week or more before the Tickets reach the Fellow, owing to the very large number, over 20,000, to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £....., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of

my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 68 in the "Book of Arrangements," 1910.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL (see advertisement pages 32 and 33) and the "Book of Arrangements."

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows is due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, in the North of England especially, as well as in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the number of Fellows.

2. Helping to swell the General Prize Fund started by Mr. A. W. Sutton, V.M.H., for providing Prizes for the Students at Wisley.

3. Providing lectures with lantern slides.

4. Presenting books to fill the gaps in the Library both at Vincent Square and at Wisley.

5. Sending new and rare Plants and Seeds for the Garden and surplus roots for distribution to the Fellows.

Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary, therefore, asks those who read these lines to do their best to help in any of the ways above indicated.

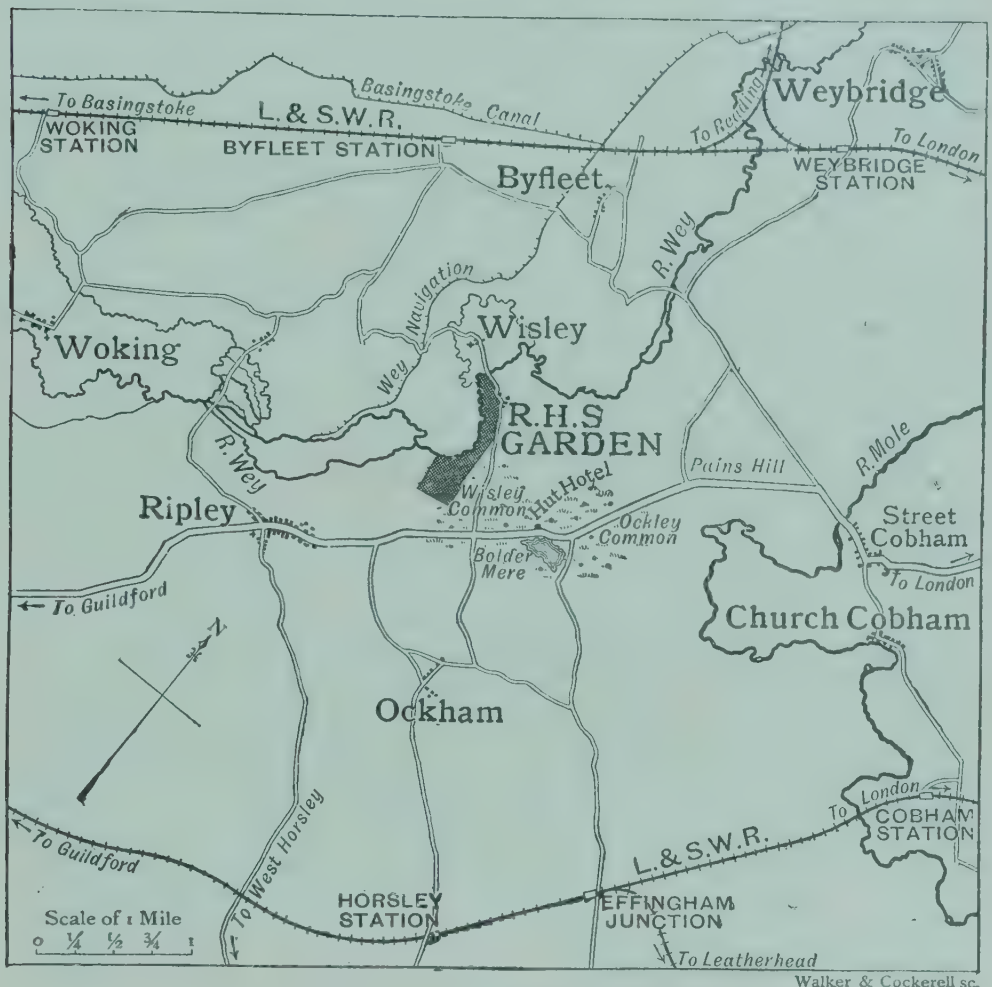
Since the above was written the following have been received for

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

Wisley: A collection of Mr. Burbank's Californian productions, from Mrs. Rotch; a further large assortment of Mr. E. H. Wilson's introductions from China, from the Hon. Vicary Gibbs and Mr. Harry J. Veitch, V.M.H.; the collection of insects and drawings formed by the late Mr. G. S. Saunders, F.L.S., from Mrs. Edward Saunders. And, for Vincent Square, photogravures of the late Lord Penzance, from Miss Jekyll, and of the late Sir Charles Strickland, from his daughter.

11. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good



POSITION OF THE SOCIETY'S GARDENS.

Friday, Christmas Day, and Exhibition days. Each Fellow's ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White,

fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours 10*s.*; or to and from Horsley, 7*s.*; Effingham Junction, 7*s.*; Byfleet, 7*s.* Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s.* by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 106.

12. TRIALS AT WISLEY IN 1910–11.

Trials of Fruits, Flowers, and Vegetables at the Wisley Gardens during 1910–11 have been arranged:—

N.B.—Everything sent for trial *must be named*, and the name and address of the Sender attached.

For full particulars see "Book of Arrangements for 1910," p. 107.

13. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture, and Lecturer to the Students.

14. STUDENTS AT WISLEY.

The Society admits young men, between the ages of 16 and 22 years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also lectures, demonstrations, and elementary Horticultural Science in the Laboratory, whereby a practical knowledge of simple Garden Chemistry, Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students can enter only at the end of September or at the end of March. Selected Students have also the advantage of attending certain of the Society's Shows and Lectures in London.

15. DISTRIBUTION OF SURPLUS PLANTS.

In a recent Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the

Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was therefore decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by ballot.

Fellows are therefore particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are of necessity *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is therefore obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending-out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their form properly.

16. HIRING OF THE SOCIETY'S HALL.

The Royal Horticultural Hall and Offices are situated in Vincent Square, which lies straight through Ashley Gardens from Victoria Street, Westminster, and is about five minutes' walk from the Victoria and St. James's Park Stations.

Fellows are earnestly requested to make known among their friends and among other institutions that the ROYAL HORTICULTURAL HALL is available for Meetings, Shows, Exhibitions, Concerts, Conferences, Lectures, Balls, Banquets, Bazaars, Receptions, and other similar purposes.

POSITION OF THE SOCIETY'S HALL.

The Hall has a floor surface of 13,000 square feet. It is cool in summer and warm in winter. For a Concert it will seat 1,500, or for a public meeting 1,800. A Sound-board has been added, and it was recently said by one of the candidates in the parliamentary election that the Hall is now a place where speaking becomes easy and delightful. Full particulars for hiring may be obtained on application to the Secretary, R.H.S., Vincent Square, Westminster, S.W., with whom dates may be booked.

17. EXHIBITIONS, MEETINGS, AND LECTURES IN 1910.

The programme will be found in the "Book of Arrangements" for 1910. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (33) of halfpenny cards *ready addressed* to himself.

The following are the dates fixed for 1910 :—

Jan. 11, 25
Feb. 8, 22
March 8 and 9 (Bulbs), 22, 23
April 5, 19
May 3, 17, 19, 24 to 26 (Temple Show)
June 7, 21
July 5 and 6 (Holland Park), 12 and 13, 19 and 26.
August 2, 16, 30
Sept. 13 and 15, 27, 28
Oct. 11, 13 and 14 (Fruit Show), 25 (Vegetable Show)
Nov. 8, 22
Dec. 1–3, 6, 13

18. BRITISH FRUIT AND VEGETABLES.

In 1910, instead of the system of scattering the prizes offered all through the year, they will be concentrated on two meetings, the Great Fruit Show being held on October 13 and 14, and the Vegetable prizes being combined with the Ordinary Meeting on October 25. The Schedules of the Prizes are now ready on application.

19. CHALLENGE CUPS FOR VEGETABLES.

A handsome £20 Challenge Cup has been presented to the Society by Messrs. Sutton, of Reading, and the Council have decided to offer it, with £10, for the best collection of twelve kinds of vegetables on October 25. The Society also offers a Champion Challenge Cup for the greatest number of points obtained by any one exhibitor throughout the same Exhibition, the winner of the Sutton Cup being excluded. These Cups may be won by the same exhibitor only once in four years, but he may compete every year for any second prize that may be offered.

20. COLONIAL-GROWN FRUIT SHOW, 1910.

An Exhibition of Colonial-grown Fruits and Vegetables will be held on December 1 to 3, 1910.

Particulars will be found in the "Book of Schedules" for 1910.

21. SHOWS OF KINDRED SOCIETIES IN 1910.

The following dates have been fixed, on which R.H.S. Fellows' tickets will admit :—

March 23.—Stour Valley Gardening Society.
May 3.—Auricula and Primula Society.
May 17.—Tulip Society.
June 9.—Perpetual Flowering Carnation Society.
July 12–13.—Sweet Pea Society.
July 26.—Carnation and Picotee Society.
September 15.—Rose Society.
September 28.—Vegetable Society.
December 13.—Carnation Society.

For Schedules of these Shows see under above dates in the "Book of Arrangements," 1910.

22. LECTURES.

The new Lecture Room is fitted with an electric lantern of the most modern construction; gas and water are laid on, and every provision has been made for the illustration and delivery of Lectures.

Any Fellows willing to Lecture, or to communicate Papers on interesting subjects, are requested to communicate with the Secretary.

23. "THE MASTERS LECTURES."

Fellows will remember the intimate connection with the Society of the late Dr. Masters, F.R.S., who did much for horticulture by drawing constant attention to the various ways in which scientific discovery and research might be made serviceable to gardening; and it will also be remembered that a fund was established by subscription to perpetuate his memory in connection with the Society and to carry on in some degree his work of science in relation to gardening. "The Masters Lectures" were accordingly founded, and the first two were given during 1909 by Professor Hugo de Vries, of Amsterdam.

In 1911 Professor G. F. Scott-Elliot, M.A., B.Sc., will be the Lecturer on February 28 and March 14.

24. EXAMINATIONS, 1910.

1. The Annual Examination in the Principles and Practice of Horticulture was held on Wednesday, April 20, 1910. The examination has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Candidates had to send in their names not later than March 30. Particulars for 1911 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1910 (price 2*s*. post free) may also be obtained from the Office. The Society is willing to hold an examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Society is prepared to extend this examination to residents in the Colonies; and, at the request of the Government of the United Provinces of India, it was held in 1910—altered and adapted to local requirements—at Saharanpur and Calcutta in India, and also in South Africa.

In connection with this examination a Scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners, to be awarded after the 1910 examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged

equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society also held an Examination in Cottage Gardening on Wednesday, April 27, 1910. This examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this examination is on similar lines to that of the more general examination. Questions on Elementary Chemistry and Biology are now added to this examination.

3. The Society will hold an examination in the Royal Horticultural Hall, Vincent Square, S.W., on Monday, January 16, 1911, for gardeners employed in Public Parks and Gardens belonging to County Councils, City Corporations, and similar bodies. Entries close on January 2, 1911.

Medals and Certificates are awarded and Class Lists published in connection with these examinations. The Syllabus may be obtained on application to the Secretary R.H.S., Vincent Square.

25. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions by applying to the Secretary R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

26. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can be inspected only at the *written* request of the *owner*.

27. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 200 Societies have joined our ranks, and the number is steadily increasing.

The Parent Society offers annually a Silver Challenge Cup to be competed for by Affiliated Societies. (See "Book of Schedules," under date October 13 and 14.)

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

28. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A new and revised list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary R.H.S., price 3*d.*

Lantern slides on horticultural topics are much needed, and their gift will be appreciated.

29. COLOUR CHART.

Hardly a gardener or florist exists who has not at times longed for a Colour Chart—that is to say, for a standard of reference whereby he could himself name, or recognize, or convey to a friend at a distance, the *exact* shade of colour of a flower he desired to procure or had seen advertised, or wished to commend to a friend. Take, for example, the word "crimson"; what a multitude of colours and shades it may be made to include! Some, very beautiful; some, horrible concoctions of red and blue crudely combined.

The Council of the Society have long felt the need of such a Colour Chart, but the huge expense of production has hitherto deterred them from issuing it.

Not long since an admirable chart, containing more than 1,450 shades of colour between white and black, was published at the instance of the French Chrysanthemum Society, the price being £1 1*s.* net, and by it it is now possible to *exactly* recognize or describe to a friend or purchaser at a distance the precise colour of any possible flower. You may have met with an Azalea, for instance, which greatly strikes your fancy; you take out your Chart and match its shade, and describe it to your friend or your nurseryman as, "Colour: Apricot, p. 53, shade 3," and he turns to his Chart and sees *exactly* what it is you want or describe. Or you

want to make someone understand the exact shade of a rose in the way of "Andersoni," and you need only say, "Rosy pink, p. 118, shade 4," and your correspondent turns to his Chart and sees in a moment exactly what it is you want to describe. Or a nurseryman, having raised a new variety, can by simply quoting "Colour Chart, p. —, shade —," exactly represent to his customers the colour-beauty of his new introduction.

The Council recognizing both the excellence and the usefulness of this Chart, the idea at once occurred: Could it not be adopted as an International Standard, so that all lovers of flowers all over the world could accurately and exactly describe to one another (no matter how far away or speaking what language) the colour and shade of any particular flower they refer to? There seemed no other difficulty than the somewhat prohibitive cost of £1 1*s.* net. But difficulties only exist to be overcome, and by undertaking to be responsible for a very large number the Society is now in a position to offer this Chart to its Fellows at the reduced cost of 14*s.* 6*d.*, for which price it can be obtained at the Society's Offices, Vincent Square, or it can be sent free by post for 15*s.*; but in all cases a cheque or postal order must be sent beforehand.

This Chart will, of course, be found vastly useful for many other purposes; for example, a lady wishing to match a certain shade has only to refer her dressmaker to such and such a colour on p. —, shade —, and it can be infallibly matched. An artist wishing to describe the colour of the sky on a certain sundown can do so exactly by reference to the Chart. And in many other like ways it must prove generally useful, containing as it does every possible shade of colour between black and white.

This Chart is being adopted extensively by dyers, mercers, drapers, and others, in all countries, as a result of its introduction through our Society.

A large and rapid sale has already been created, and the Council hope that Fellows will avail themselves freely of this offer, as there is now a real prospect of its being very widely adopted as a regular International standard. It should be quoted as "The Royal Horticultural Society's Colour Chart."

30. MONOGRAPH ON FUNGOID PESTS.

The attention of Fellows is directed to a handsome volume published by the Society on "Fungoid Pests of Cultivated Plants," by Dr. M. C. Cooke, V.M.H. It consists of 280 pages of letterpress, and is illustrated with 24 coloured plates, containing figures of 360 different fungoid attacks, and 23 woodcuts. It also contains a Chapter on Fungicides, which explains clearly how to make the different washes and sprays, and gives the proportions in which the various ingredients should be used. The whole work is written so as to interest and instruct the cultivator in the simplest and most practical manner. The volume makes an admirable school prize or gift to a gardener or student of nature. Price 5*s.*, R.H.S. Office, Vincent Square.

"No one whose plants are subject to fungoid attacks—and whose are not?—should be without this book; for not only can they by its use identify the disease at once, but they are also told both how to treat it

and overcome it, and also how to make the different washes and spray which the different classes of fungoid attacks require."

31. ALTERATIONS IN RULES FOR JUDGING—1909 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," were revised and considerably modified in 1909. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The secretaries of local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the revised Rules (1909 Code) have been still further modified, and will until further notice stand as follows:—

	Specimens		Specimens
Asparagus	36	Marrows	3
Beets	9	Mushrooms	12
Broad Beans	24	Onions	12
Broccoli	6	Parsnips	12
Brussels Sprouts	36	Peas	36
Cabbages	3	Potatos	12
Carrots	12	Radish	24
Cauliflower	6	Runner Beans	24
Celery	6	Seakale	12
Cucumber	2	Shallots, large bulbs	24
French and Climbing Beans	36	„ small clusters	3
Kale, whole stem, to show habit	3	Tomatos	12
Leeks	12	Turnips	12
Lettuce and Endive	6		

32. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s.* The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

33. VARIETIES OF FRUITS.

Many people plant Fruit trees without a thought of what Variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d.* they can obtain from the Society a little

16-page pamphlet which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of Fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d.*, or 25, 2*s.*; 50, 3*s.*; 100, 4*s.*

34. PLANTS CERTIFICATED.

The last published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further 10 years have now passed and the Council have decided to republish the list up-to-date, constituting a record of all the plants which have received awards during the past 50 years. The completed list will be of welcome assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It will be ready for issue shortly, price 2*s.* post free.

Orchids Certificated.

The list of awards made to Orchids has also been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s.* net.

35. INTERNATIONAL HORTICULTURAL EXHIBITION.

1912.

PRELIMINARY NOTICE.

An INTERNATIONAL HORTICULTURAL EXHIBITION in London in 1912 is being organized by a Special Committee, quite independently of the Royal Horticultural Society, and notification has been received that the schedule, particulars as to site, &c., will shortly be made public. All inquiries should be addressed to Edward White, Esq., Hon. Sec. International Exhibition, 1912, 7 Victoria Street, Westminster.

Definite dates and further particulars will be issued as soon as possible.

36. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of approval of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden plot keeping, or nature study, has secured the first prize. The cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W., price 6*d*. each. Space is left for the signatures of the head master or mistress and a member of the educational authority concerned. The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number of prizes awarded in the competition, (*e*) the full name of the first prize winner. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

37. "SCALY LIZARD" WANTED.

The Secretary of the Society has a great desire to reintroduce the common "scaly lizard" of English heaths and gorse commons in a neighbourhood where it once was common but from which it has in recent years disappeared. Would any Fellow of the Society living in a district where the lizard is abundant be so very kind as to catch half a dozen or so, and send them by post in a tin box *with air holes*, addressed Rev. W. Wilks, Shirley Vicarage, Croydon? The box must not be wrapped in paper, or the inhabitants will get no air and die. It should have a little grass and a few sprays of heather inside, and be simply tied round tightly with string and several *small* holes made in each side for air to enter freely. Mr. Wilks will be vastly grateful to any sender, and will give the little strangers a hearty welcome and introduce them to a gloriously sunny bank with rough stones to lie under and plenty of heather and gorse near by, with flies and beetles in abundance and no children to break off their tails.

38. PLANT LABELLING.

Complaints are frequently received from Fellows to the effect that plants in groups are insufficiently or too inconspicuously labelled. The Secretary therefore urges that name cards affixed to plants be boldly and plainly printed or written in print-like letters.

39. SPRING BULB SHOW, 1911.

The Council of the Royal Horticultural Society have accepted the offer of the following prizes from the General Bulb Growers' Society at Haarlem, to be competed for on March 14 and 15, 1911.

*Division I.—For Amateurs.**

Class 3.—Eighteen Hyacinths, distinct.

1st Prize . .	£6 6*s.*	4th Prize . .	£3 3*s.*
2nd „ . .	£5 5*s.*	5th „ . .	£2 2*s.*
3rd „ . .	£4 4*s.*	6th „ . .	£1 1*s.*

Class 4.—Twelve Hyacinths, distinct.

1st Prize . .	£5 5*s.*	4th Prize . .	£2 2*s.*
2nd „ . .	£4 4*s.*	5th „ . .	£1 1*s.*
3rd „ . .	£3 3*s.*		

Class 5.—Six Hyacinths, distinct.

1st Prize . .	£2 2*s.*	3rd Prize . .	£1 1*s.*
2nd „ . .	£1 10*s.*	4th „ . .	10*s.*

Class 6.—Four pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans they are shown in.

1st Prize . .	£4 4*s.*	3rd Prize . .	£2 2*s.*
2nd „ . .	£3 3*s.*	4th „ . .	£1 1*s.*

Division II.—For Trade Growers.

Class 7.—Collection of 100 Hyacinths in twenty-five named varieties, four blooms of each variety, grown in pots or glasses.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Class 8.—Collection of 120 Hyacinths in twelve varieties in pans, ten roots of one variety in each pan. The bulbs need not have been actually grown in the pans they are shown in.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Regulations.—For Classes 3, 4, and 5 each bulb must be in a separate pot (size optional). Classes 3, 4, 5, and 6 must all be single spikes; no spikes may be tied together. Exhibitors may compete in one only of the classes numbered 3, 4, and 5.

All bulbs must have been forced entirely in Great Britain or Ireland. All varieties must be correctly named.

40. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

* The Society recognizes only three divisions of growers:

1. Amateurs growing for their own use or pleasure, and employing assistance or otherwise.
2. Trade, growing for retail sale.
3. Market gardeners, growing wholesale for market.

FELLOWS' PRIVILEGES OF CHEMICAL ANALYSIS.

(Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.)

The Council have fixed the following rates of charges for Chemical Analysis to Fellows of the Society being *bonâ fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bonâ fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners, when forwarding samples, are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made.

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s.* 6*d.*
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s.*
3.	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s.*
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s.*
7.	Determination of potash in potash salts, compound manures, &c.	7*s.* 6*d.*
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s.* to £1
9.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s.*
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
14.	Analysis of water of land-drainage, and of water used for irrigation	£1
15.	Analysis of water used for domestic purposes	£1 10*s.*
16.	Consultation by letter	5*s.*

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. Augustus Voelcker, 22 Tudor Street, New Bridge Street, London, E.C.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

Instructions for selecting, drawing, and sending samples for analysis will be found in the Society's "Book of Arrangements," or can be obtained on application to the Society's Office, Vincent Square, S.W.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

May 3, 1910.

Sir John T. D. Llewelyn, Bart., V.H.M., in the Chair.

Fellows elected (85).—T. Allwood, M. C. H. Ashby, Capt. D. G. Astley, Dr. E. J. G. Berkley, F. W. Black, J.P., Lady Boughton, H. H. W. Brice, F.R.G.S., T. E. Briggs, Miss I. M. Briscoe, Rev. E. L. Browne, Mrs. Buckley, Mrs. A. O. Butler, Mrs. J. A. G. Campbell, Mrs. de P. Chance, Miss H. F. Cholmeley, Miss E. L. Christie, Dr. Brown Clark, C. J. Cobbold, Lady Sybil Codrington, F. C. Collingwood, Mrs. T. Coote, H. M. Crookenden, Mrs. A. Drexel, C. H. Du Pre, W. G. Ecclestone, P. Etheridge, Miss M. E. Ford, Lady Gaselee, Mrs. Gassiot, E. J. Gibbins, Mrs. C. E. Gilroy, G. H. Glyn, H. Greenwood, M.A., LL.D., Miss H. M. Hall, Mrs. Allan Hamilton, F. Capel Hanbury, Sir Edmund Hardinge, Bart., E. M. Headley, C. Holt, Mrs. Houston, W. Tatham Hughes, Mrs. E. H. Hurry, Lady Elizabeth Inglis-Jones, F. Jennings, Mrs. C. King, A. Knight, Basil Leach, Arthur Lee, Mrs. Leslie-Moore, Mrs. F. F. Liddell, Lieut.-Col. C. Lyon, J. Macalister, Mrs. Mackenzie-Gillanders, Mrs. D. Marshall, H. Maxwell, J. Miles, Miss G. M. Mortimer, Lady Margaret Nicholson, Mrs. Ford North, Capt. H. Owen, Mrs. H. Paul, G. Pauling, Lady Pinero, Stanley L. Powell, O. T. Prettejohn, F. J. Rothon, Jushi Saigo, A. Scaife, Mrs. W. L. Sclater, W. H. Sharpe, J. C. Shenstone, C. W. Shippam, H. Davies Singer, E. P. Bisshopp Smith, Mrs. C. Spencer Smith, Miss Helen Squire, Mrs. N. Steinberg, Col. C. C. Trench, C. C. Tunks, Mrs. Veley, John S. Ward, Mrs. Arthur Ware, H. L. Wettern, Guy Whinygates, Mrs. Llewellyn Williams.

Fellow resident abroad (1).—William Hunt (Canada).

Associates (3).—Miss L. M. Clarke, Miss R. Middleton, Miss A. M. Thomson.

A lecture on "Future Forest Trees" was given by Dr. A. Henry, M.A., F.L.S., V.M.H.

REPORT ON THE BRUSSELS HORTICULTURAL CONGRESS (SECTION 7).—NOMENCLATURE.

April 30 to May 3, 1910.

Dr. A. B. Rendle, M.A., F.R.S., F.L.S., and Mr. E. A. Bowles, M.A., F.L.S., F.E.S., the delegates from the Royal Horticultural Society to the Horticultural Congress at Brussels, report that the findings on the various questions before the Congress concerning nomenclature of garden plants were as follows:—

Question 1.—It was decided to adopt the rules of botanical nomenclature adopted by the Vienna Congress of 1905, with some modifications and additions as regards horticultural varieties and hybrids of cultivated plants.

Question 2.—It was decided that the names of garden varieties might be expressed either in Latin or the vulgar tongue.

Question 3.—Names in the vulgar tongue are not to be translated when used in any other country.

Question 4.—Names of garden varieties should be expressed as far as possible by one word, or by two, or by three at the most.

Question 5.—In addition to the methods of publication allowed by the botanical rules, the publication of a garden variety with a description in a nurseryman's catalogue *bearing a date* is valid. But mere mention of a variety, or a figure without a description, is not valid publication. It is recommended that such descriptions be further published in some horticultural periodical.

Question 6.—The description must be drawn up in one of the following languages: Latin, English, French, German, Italian.

Question 7.—Hybrids between species of the same genus are designated by a name and a formula. The sign × is placed before the generic name. The formula consists of the specific names of the two parents united by the sign × and placed in brackets; the name of the seed-bearing parent stands first and is indicated by the sign ♀.

Question 8.—The specific name of a hybrid may be expressed in Latin, or in a vulgar tongue written in roman characters.

Question 9.—The specific name of a hybrid should be expressed if possible by a single word; but it is permissible to use two or three words.

Question 10.—This is provided for by the answer to the last question.

Question 11.—All the hybrids obtained by crossing the same two species must bear the same specific name. All forms resulting from the same crossing or from successive crossings of varieties of these two species should be associated as varieties under the same specific name.

Question 12.—The names of horticultural varieties of hybrids must be expressed in the vulgar tongue.

Questions 13 *and* 14.—Crosses between varieties of one species and hybrids of the third or higher order are designated by a name or a formula, and follow the rules for ordinary hybrids.

Question 15.—Bigeneric hybrids are also designated by a name and a formula. The generic name is formed, so far as possible, by combining the generic names of the parents, and is preceded by the sign × × and followed by a specific name.

Question 16.—We write *Laeliocattleya*, not *Laelio-Cattleya*.

Question 17.—After considerable discussion the recommendation of the R.H.S. Sub-Committee was adopted, viz. plurigeneric hybrids receive a conventional generic name, formed from that of some distinguished person with the termination "ara." The generic name is formed for each distinct combination of genera. All the combinations of any given genera A.B.C.D., whatever the order in which they are combined, receive the same generic name.

Question 18.—For valid publication a new hybrid must be named according to the rules, and described with a formula.

It was agreed that the rules should not be retrospective.

It was agreed that a horticultural index was eminently desirable.

[It is hoped to publish the precise wording of the findings in due course.]

TEMPLE SHOW.

May 24, 25, 26, 1910.

JUDGES.

Orchids.

Chapman, H. J.
Fowler, J. Gurney
Little, H.
Wellesley, F.

Roses.

Jefferies, W. J.
Jennings, John
May, H. B.
Shea, Chas. E.

Carnations.

Barnes, N. F.
Blick, Chas.
Douglas, Jas., V.M.H.
Turner, Arthur

Tulips.

Jacob, Rev. J.
Walker, Jas.
Ware, W. T.

Fruit and Vegetables.

Challis, T., V.M.H.
Nix, C. G. A.
Poupart, W.
Rollit, Sir Albert, LL.D.

Groups in the Open Air.

Crump, W., V.M.H.
Fielder, C. R.
Pearson, A. H.
Thomson, D. W.

Hardy Herbaceous Plants.

Beckett, E., V.M.H.
Bowles, E. A., M.A.
Grandfield, J.
Veitch, P. C. M.

Rock and Alpine Plants.

Bilney, W. A.
Clutton-Brock, A.
Lynch, R. Irwin, V.M.H.
Moore, F. W., V.M.H.

Foliage Plants.

Bain, W.
Baker, W. G.
Hudson, Jas., V.M.H.
McLeod, J. F.

Flowering Plants.

Chapman, A.
Howe, W.
Paul, Geo., V.M.H.
Reynolds, G.

Miscellaneous.

Dixon, C.
Kingsmill, A.
Notcutt, R. C.
Odell, J. W.

Special Orchid Prizes.

Bound, W. P.
Crawshay de Barri
White, W. H.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

Gold Medal.

Leopold de Rothschild, Esq. (gr. Mr. J. Hudson, V.M.H.), for *Vanda teres*.
F. Menteith Ogilvie, Esq. (gr. Mr. Balmforth), for Orchids.
Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H), for vegetables.
Messrs. J. Veitch, for flowering plants.
Messrs. J. Veitch, for foliage plants.
Messrs. Sutton, for flowering plants.
Messrs. Sutton, for Tulips.
Messrs. H. B. May, for exotic ferns.
Messrs. Wm. Paul, Waltham Cross, for Roses.
Messrs. Paul, Cheshunt, for Roses.
Messrs. Sander, for Orchids
Messrs. Charlesworth, for Orchids.
Messrs. T. Rivers, for fruit trees in pots.
Messrs. R. Wallace, for rock garden and herbaceous plants.

Sherwood Cup.

Sir J. Colman, Bart. (gr. Mr. Collier), for Orchids.

Silver Cup.

His Grace the Duke of Marlborough (gr. Mr. G. Hunter), for Orchids.
Sir G. Faudel Phillips (gr. Mr. F. Fitch), for Tulips.
J. Talbot Clifton, Esq. (gr. Mr. J. Float), for Orchids.
Messrs. J. Backhouse, for alpine plants and rock garden.
Messrs. Barr, for Japanese trees, Tulips, and hardy flowers.
Mr. H. Burnett, for Carnations.
Messrs. B. R. Cant, for Roses.

Messrs. J. Carter, for Japanese garden and flowering plants.
Messrs. Cuthbert, for Azaleas and Tulips.
Messrs. W. Cutbush, for alpines, Roses, &c.
Messrs. J. Cypher, for Orchids.
Mr. A. F. Dutton, for Carnations and Poppies.
Mr. Amos Perry, for Tulips and hardy flowers.
Messrs. J. Peed, for Caladiums and flowering plants.
Messrs. J. Hill, for exotic ferns.
Messrs. W. Fromow, for Japanese Maples.
Messrs. G. Mount, for Roses.
Messrs. Stuart Low, for Orchids, Roses, &c.
Mr. L. R. Russell, for hardy trees, &c.
Mr. Chas. Turner, for Roses and Azaleas.
Hobbies, Ltd., for Roses.
Messrs. Mansell & Hatcher, for Orchids.
Messrs. J. Veitch, for flowering trees and shrubs.
Messrs. J. Waterer, for Rhododendrons, &c.
Mr. M. Prichard, for hardy flowers.

Silver-gilt Flora Medal.

Messrs. W. Artindale, for Violas and hardy flowers.
Messrs. Blackmore & Langdon, for Begonias.
Messrs. Frank Cant, for Roses.
Messrs. A. Dickson, for Roses and Tulips.
Mr. R. C. Notcutt, for hardy flowers.
Mr. G. Lange, for Carnations.
Mr. G. Reuthe, for Tulips and hardy plants.
Messrs. Ker, for Amaryllis.

Silver-gilt Banksian Medal.

Messrs. T. S. Ware, for Alpines and Begonias.
Messrs. G. Jackman, for Clematis and hardy plants.
Messrs. J. Cheal, for rock and alpine garden.
Mr. W. H. Page, for Carnations, Lilies, &c.
Mr. C. Engelmann, for Carnations.
Mr. W. H. Lancashire, for Carnations.
Mr. E. V. Low, for Orchids.
Mr. A. J. Bruce, for Sarracenias.
Messrs. Bakers, for rock garden and hardy plants.

Silver Flora Medal.

E. J. Johnstone, Esq. (gr. Mr. A. T. Paskett), for Carnations.
Messrs. R. H. Bath, for Carnations, Tulips, &c.
Messrs. G. & A. Clark, for hardy flowers.
Messrs. E. W. King, for Sweet Peas and Carnations.
Messrs. Toogood, for winter-flowering Stocks.
Mr. W. E. Alsen, for Sweet Peas.
Mr. H. H. Crane, for Violas.
Mr. F. Lilley, for Irises and Gladioli.

Messrs. G. Bunyard, for hardy flowers and Tulips.
Messrs. Hogg & Robertson, for Tulips, Ixias, &c.
Messrs. J. Cocker, for Trollius and Anemones.
Misses Hopkins, for rock garden.
A. D. Hall, Esq., for Tulips.
Messrs. T. Rochford, for new ferns.
Mr. H. Hemsley, for rock garden.
Messrs. H. Cannell, for Begonias, &c.
Messrs. H. B. May, for flowering plants.
Mr. W. J. Godfrey, for Poppies.
The Craven Nursery, for alpine plants.
Messrs. Hughes, Jones & Peers, for Carnations, Salads, &c.
Mr. B. E. Bell, for Carnations.
Mr. C. Elliott, for rock garden and alpine plants.
Messrs. Gunn, for hardy flowers.
Mr. A. J. Harwood, for Asparagus.
Mr. R. Sydenham, for Sweet Peas.
Mr. C. F. Waters, for Carnations.
Messrs. Bees, for Primulas.
Messrs. Bull, for Orchids and foliage plants.
Messrs. Dobbie, for Violas and Sweet Peas.
Messrs. B. Ladhams, for hardy herbaceous plants.
Messrs. Piper, for Maples and topiary work.

Silver Knightian Medal.

R. Stephenson, Esq., for Asparagus.
S. Mortimer, Esq., for Cucumbers, Tomatos, &c.
Messrs. Laxton, for Strawberries.

Silver Banksian Medal.

R. Ashworth, Esq. (gr. Mr. Gilden), for Orchids.
H. Correvon, Esq., for alpines.
Messrs. Storrie & Storrie, for Auriculas.
Messrs. Pulham, for a rock garden.
Messrs. J. Forbes, for hardy flowers.
Messrs. Heath, for a rock garden.
Messrs. Kelway, for tree Pæonies.
Messrs. G. Gibson, for hardy flowers.
Messrs. Seagrave, for Pansies and Violas.
Messrs. A. W. Young, for Anemones.
Guildford Hardy Plant Nursery, for alpines, &c.
Messrs. G. Mallett, for alpines.
Messrs. Carter Page, for annuals, Violas, &c.
Wickham Noakes, Esq., for Calceolarias.

Bronze Flora Medal.

Hon. Mrs. Glyn (gr. Mr. J. Friend), for Begonias.
King's Acre Nursery, for alpines, &c.
Messrs. E. Webb, for flowering plants.

Messrs. W. & J. Brown, for herbaceous plants.
Messrs. H. J. Jones, for flowering plants.
Messrs. Whitelegg & Page, for Tulips, alpines, and Sweet Peas.
Messrs. Young, for Carnations.

GENERAL MEETING.

June 7, 1910.

Mr. Arthur W. Hill, M.A., F.L.S., in the Chair.

Fellows elected (178).—W. E. Alsen, Mrs. J. Annan, Mrs. J. P. Arkwright, G. F. Aston, Mrs. J. S. Austen, Mrs. Bagram, Mrs. C. Bearcroft, J. G. Bennett, T. Bennett, T. F. Besent, Hon. Mrs. Trevor Bigham, C. Bird, Mrs. E. Birkbeck, D. Birt, Hon. Mrs. Blezard, E. E. Boorne, H. Brown, Sir John Brunner, Mrs. J. T. L. Brunner, W. E. Bunclark, N. S. Burnell, Mrs. W. C. Burton, Mrs. J. Butchart, Miss C. Caine, Col. Colin Campbell, Miss E. F. Cardale, Capt. Sir Frederick Carden, Bart., Mrs. W. D. Caröe, Mrs. W. R. Carr, Mrs. G. O. Carter, E. Cawston, F. W. Chambers, G. H. de P. Chance, Mrs. de P. Chance, W. H. Clarke, C. F. Clay, M.A., F. J. Cole, F. A. Coleman, Lady Gwendoline Colvin, Rev. S. E. Cottam, Tudor Crawshay, J.P., D.L., A. Crepin, Sir Charles Crosthwaite, W. H. Cullen, Mrs. C. W. Curtis, Mrs. Davies, Lady Dering, Mrs. W. B. Dickinson, Mrs. W. Downs, Mrs. J. Dunn, W. Dyke, Miss E. J. Earle, Mrs. L. F. Eastburn, E. Upton Eddis, G. T. Edwards, W. Ellis, A. W. Evans, Miss Ewens, Valdemar Faber, A. J. Finch, J. Forbes, L. R. W. Forrest, S. Fredericks, Miss Garrod, A. H. Gates, Miss M. V. Goldie, Mrs. G. A. D. Goslett, Mrs. Gower, Miss M. I. Graham, Mrs. Greenwood, Mrs. R. S. Hebeler, P. F. Heybourn, Miss M. Hickman, L. C. Higgins, A. Hildesheimer, Mrs. C. Hitchcock, Mrs. Hobson, C. A. Hoghton, Miss C. G. Hollins, Miss L. B. Hollins, Mrs. H. Hordern, Hon. Catherine Hozier, Mrs. Huddart, Mrs. T. R. Hughes, A. D. Innes, H. Jellicorse, Miss B. Lawson Johnston, E. J. Johnstone, Lady Joicey, L. M. Josling, E. Kanthack, Miss C. M. Kempe, B. E. Dunbar Kilburn, Miss M. H. Kisch, Mrs. W. Lamaison, Miss S. Laurie, H. Ellice Lees, Miss J. C. Leighton, G. Pigé Leschallas, Mrs. G. J. Lidstone, Rev. C. H. D. Lighton, Mrs. J. B. Littledale, R. H. Lucas, Capt. R. M. Luckock, Miss M. V. Martin, Mrs. Mason, Col. W. J. Massy, Mrs. E. Mathews, Mrs. Maxwell, H. J. Meyer, J.P., F. H. R. Middleton, Mrs. Miesegaes, Mrs. Montague, T. Mosley, J.P., D.L., R. T. Naish, H. C. Newton, Mrs. H. Nicholl, H. B. Nicholson, Major G. Noble, Mrs. J. H. Oakley, Mrs. C. Parbury, C. A. Parker, J.P., A. Parmenter, J. E. Paton, Mrs. H. P. Pease, Mrs. Parkins, Lady Perrott, Mrs. S. A. Peto, A. Phillips, Edward Powell, Mrs. Powell, Mrs. Prichard, H. E. Prior, E. J. Reid, Mrs. Percy Reid, E. D. Reynolds, Mrs. Reynolds, Miss A. E. Rose, J. Kent Sanders, P. Sassoon, B. Schonberger, Mrs. Scott-Elliot of

Arkleton, E. Seyd, Miss A. B. Shepard, P. Short, M.A., B.C.L., Mrs. Dundas Simpson, E. Sims, F. E. Smith, Philip Smith, Mrs. J. Snowden, Mrs. G. Strickland, G. Sutton, Mrs. Sweetman, Mrs. H. J. Tennant, Miss A. M. Thompson, Miss G. L. Torr, Mrs. Trechmann, J. S. Trotter, H. F. Usborne, Mrs. H. Vallance, Mrs. Vasey, Mrs. Vinson, John Vyse, Col. W. Hall Walker, Mrs. G. Walker, Rev. W. R. Wareing, Mrs. P. A. Watt, G. M. White, Mrs. A. G. White, Mrs. T. S. Whitfeld, Mrs. G. A. Wigram, C. Wilkinson, Mrs. J. H. Williams, Mrs. W. P. C. Wills, W. D. Wiltshire, Mrs. Winterbottom, H. Woodruff, Mrs. G. C. Woods.

Fellows resident abroad (6).—H. Eicke (Frankfurt), S. Isshiki (Tokyo), W. Lieb (Crefeld), P. J. C. Osthock (Boskoop), F. van der Bom (Oudenbosch), W. Webber (Johannesburg).

Associates (6).—Miss B. Gilbert, Miss C. Hemsley, Miss E. How, E. Johnson, Miss R. E. Mead, Miss M. Rounthwaite.

Societies affiliated (5).—Bletchley and Fenny Stratford Horticultural Society, Coggeshall Flower Show, Northampton Municipal Horticultural Society, Wakefield Paxton Society, Watford Amateur Mutual Improvement Society.

A lecture on "Survivals among Plants of the Past" was given by the Rev. Prof. G. Henslow, V.M.H. (see p. 307).

GENERAL MEETING.

June 21, 1910.

Mr. Alexander Dean, V.M.H., in the Chair.

Fellows elected (145).—Mrs. J. Adkin, Mrs. J. Alston, Mrs. Badeley, A. F. Basset, Mrs. R. C. Batley, Mrs. D. J. Bedford, F. A. Bell, Miss Bodle, S. E. Bonfellow, H. S. Boyden, Miss M. M. Bradford, L. Breitmeyer, Lady Brocklehurst, E. J. Bromley, Mrs. Collis Browne, Sir James Buckingham, C.I.E., Mrs. F. M. Bulley, Mrs. T. Bullough, A. Burnett, Miss F. Bury, Miss R. Callander, G. H. Cantle, Mrs. H. Carlile, Mrs. Carr, Lady Carson, E. S. Challinor, Mrs. Combe, Bruce Cook, H. Coombe, W. Cooper, Sir Clifford J. Cory, Bart., Miss A. Crake, Mrs. Creagh-Osborne, Mrs. H. Daniell, E. T. G. Davies, Mrs. G. P. Dawson, Ramm de Escofet, Admiral C. G. Dicken, Mrs. Harvey Dixon, Mrs. J. Gordon Dugdale, Rev. T. B. Eddrup, Sir Walter Egerton, K.C.M.G., B. Eyre, G. P. Fèvre, A.C.P., George Fish, Mrs. H. P. Foley, Mrs. J. A. Forster, Miss H. C. Gabriel, Alfred Gill, Mrs. F. Gleadow, Mrs. Goddard, J. Forbes Gordon, Neil Gossage, Capt. F. D. Grissell, R. Hood Haggie, Miss E. S. Haldane, H. F. Hannibal, Mrs. R. M. Hapgood, H. Neville Harris, Miss C. M. Harrison, E. Barnett Hill, Walter Hill, Mrs. C. Shirreff Hilton, R. A. Hoare, A. S. Horne, J. F. W. Hooper, Leon Hymans, Mrs. F. D. Ingall, W. Evans Jackson, Miss C. Johnston, Mrs. A. Menzies Jones, W. Lindley Jones, R. M. Kindersley, Mrs. Kingsley, H. C. Knowles, M.A., B.C.L., C. G. Sneyd Kynnersley, H. Lakeman, Sir William J.

Lancaster, Mrs. W. H. Levin, F. Litchfield, the Earl of Liverpool, A. W. Livingstone, Mrs. J. H. Lloyd, Mrs. G. Lyon, W. McAl'ister, H. R. Medlock, F. C. Mills, J.P., Miss M. W. Mitchell, Mrs. F. Mowatt, Mrs. Moxham, Capt. A. E. C. Myers, R.A., Mrs. W. Newall, Irving H. Nicholls, H. Oppenheim, Mrs. H. Oppenheim, C. W. Pasbach, Mrs. A. Pears, Francis Pears, Mrs. F. Pears, W. A. Perry, Miss A. F. F. Pilling, Frederic Pine, Francis E. Powell, R. Prashad, C. H. Pratt, R. B. Pringle, C. R. H. Randall, Hugh Reilly, Mrs. Pitt Rivers, Dr. C. M. Roberts, Hon. Piers St. Aubyn, Lord Sandys, Lady Sandys, Mrs. R. H. Savory, Mrs. Schwartze, Mrs. C. J. Scott, Mrs. H. C. Sharpe, Mrs. J. Winkley Smith, J. Stallard, F. Start, Mrs. Stirling, E. Lyall Swete, Mrs. Molesworth Sykes, F. C. Taylor, Hon. Mrs. Thellusson, E. Thomas, Mrs. Thomasson, Mrs. A. Thompson, W. Thorn, W. E. Tidy, T. H. Usher, Mrs. F. Verrall, Mrs. I. L. Waldron, James Warren, Mrs. Leybourne Watson, William Webb, Lady West, Miss M. Wigram, Mrs. A. S. Williams, Miss B. Wilson, W. H. Wilson, F. G. Wood, Mrs. Vivian Wood, Mrs. Worsley, Lady Wynford.

Fellows resident abroad (3).—S. Raza Ali (India), Stephen G. Kirk (Canada), F. Longhurst (N.S. Wales).

Society affiliated (1).—Holmes Gardening Society.

Lectures on " Fifty Years Among Pansies and Violas " were given by Mr. James Grieve and Mr. W. Cuthbertson, J.P. (see pp. 312 and 315).

VISIT OF THE COUNCIL AND COMMITTEES TO THE EXPERIMENTAL FRUIT FARM AT WOBURN,

By the Invitation of His Grace The Duke of Bedford, K.G.

The kindness of feeling towards the Society so frequently shown by those who best know its work, and the manifest desire to assist it in its career of practical usefulness, was expressed in no uncertain terms on Thursday, June 23, 1910, when an invitation from the Duke of Bedford, K.G., to the Council drew a party of about forty members of the different committees of the Society to his Grace's Experimental Fruit Farm at Woburn. A most hospitable welcome was accorded them.

The party was met at Ridgmont Station by Mr. Spencer Pickering, F.R.S., and, proceeding at once to the farm, he explained the various experiments now in hand, the results of those completed, and the practical conclusions which he drew therefrom.

The soil of the farm is stiff, with a substratum of tenacious Oxford clay only two feet down, which the roots do not attempt to penetrate. The soil is apt to crack badly, and the dug surface to remain in hard clods; the site therefore cannot be considered specially suitable for commercial fruit-growing, although the majority of the trees there seem to have flourished remarkably well. But experiments made at one particular station, however well they may be planned, will generally

require confirmation on other soils, whether that at the experiment station is exceptionally good or exceptionally bad. Mr. Pickering gave expression to this in his pointed speech after luncheon. He said: "... One important result has followed the establishment of the Woburn Experimental Farm, and that is the starting of similar stations elsewhere. True, a number of separated, disjointed, small stations are not exactly satisfactory. One large Government station, supplemented with subsidiary stations in different parts of the country, and all experiments carried on in one way, is undoubtedly the necessity of the times in horticulture; but failing this ideal (to which legislation has not yet risen) the best thing is to have as many small private stations as possible; and if we at Woburn have been instrumental in leading to the establishment of such stations we shall have had our reward."

As official reports on the Woburn experiments are issued from time to time, it is unnecessary to refer to them in detail, but some of the more impressive of those actually seen were concerned with:—

1. Grassing under fruit trees, compared with cultivation.
2. The comparative values of spring and winter pruning, and of pruned and unpruned trees.
3. Root pruning annually, biennially, and quadrennially.
4. Careful and careless planting.
5. Differences in the behaviour of varieties.
6. Systems of planting fruit plots for farmers, market growers, and cottagers.
7. The relative merits of fruits and vegetables grown separately and intermixed.
8. Effects of manured and of unmanured land on different kinds of fruit trees.
9. Silver-leaf disease.
10. Frost protection (smudge fires, radiation, &c.).

The inspection of the experiments was delightfully varied by a drive through the park, the abbey being reached by one of the beautiful turfed alleys called the Rhododendron Walk. Numerous kinds of pine trees and other magnificent woodland and forest trees bounded each side of this walk, testifying to the artistic conception of the original planter and producing a deep impression on the minds of our party of practical gardeners.

At the Abbey luncheon was served, and, needless to say, enjoyed. Before leaving the dining-hall, Sir Albert Rollit, D.C.L., LL.D., Litt.D., said: "We have been told there are to be few or no speeches to-day, but as Woburn is an experimental and trial station, I have been asked by the secretary to try the experiment of disobeying rules by raising one speech and pruning it severely. We really cannot enjoy such bountiful hospitality and entertainment as have been extended to us and then depart in silence. To do so we should be even less appreciative than the man who arranged *en pension* terms with the landlady of a boarding-house and then said, 'But I ought to

have some reduction as I am a vegetarian.' Naturally, the landlady replied with: 'Oh, then I suppose you are one of those new-fangled ones what they call herbaceous boarders. Well, we don't take such as them at all.' Our reception at Woburn Abbey has been very different from that and has been greatly appreciated, and on behalf of my colleagues on the Council of the Royal Horticultural Society and the other guests, I return our most cordial thanks to the Duke and Duchess of Bedford for their most kind invitation and for the opportunity of personally observing most interesting and instructive experiments in the cultivation of the various kinds and varieties of fruit trees. In this country, as compared with the Continents of Europe and America, the State does not do much in scientific horticultural directions, but leaves such matters to individual enterprise and sacrifice, as at Woburn and Rothamsted, and the opportunities of visits like this by practical horticulturists, such as the members of the Council and Committee of the Royal Horticultural Society, are a great national scientific service. Agriculture was the most ancient of the arts which gained their name from the practice of tilling. It was once *the* art, the art of ploughing, and art and science are still at the root of agricultural progress and development. Those, therefore, who, like the Duke of Bedford, open the portals of practical science to the many who could not otherwise enter them, create a great and wide obligation, especially where, as at Woburn, they show in actual and comparative operation cultural processes and effects extending over many years, and conducted with such scientific and skilled direction and observation as that of Mr. Spencer Pickering, who enables us to see the practical application of John Stuart Mill's experimental methods applied to the cultivation of the fruits of the earth, and scientifically tests and records the operations of Nature and of the hands and instruments of man. For these, among many other reasons, I will ask those who, thanks to our host and hostess, the Duke and Duchess of Bedford, and to Mr. Spencer Pickering, have enjoyed an instructive and intellectual as well as a most delightful and generous day at Woburn Abbey, observing the beauties of Nature and art, the effects of years of cultivation of trees under varied conditions, rare animals in the park, and exotic fish in the lakes, to show their heartfelt thanks."

This toast of the health of their Graces the Duke and Duchess of Bedford was received with great acclamation and enthusiastically responded to.

Luncheon was followed by a view of the interior of the abbey, with its priceless treasures of art—pictures, furniture, and china; then a walk through the adjoining grounds to the carriages which awaited the party to drive it through the portion of the park containing the rare birds and animals for which Woburn is renowned. In this way the fruit farm was again reached, and, after further inspection, tea was served, and the time arrived for the return journey to London.

HOLLAND PARK SHOW.

July 5 and 6, 1910.

On July 4 a private view of the exhibits was afforded to representatives of the Press. About twenty-five were present, and the opportunity was taken to offer them hospitality by an informal supper, served in a tent on the Show Ground, to acknowledge their frequent services in the interests of the Society. Sir Albert Rollit, D.C.L., LL.D., Litt.D., presided, and, supper ended, he proposed the toast of the "Royal Patrons of the Society: H.M. the King and Emperor, H.M. the Queen and Empress, and H.M. the Queen Alexandra," which was loyally responded to.

In proposing "Success to our Summer Show," the Chairman said the Society was most deeply indebted to Mary Countess of Ilchester for the great privilege of holding the Show for the eighth time at Holland House, which, historically, architecturally, and æsthetically, was, with its cosmopolitan garden—English, Dutch, and Japanese—the most picturesque, and one of the most interesting, of the old houses of London, while it was associated with such names as Fairfax, Fox, Addison, Macaulay, Penn, and, for its nineteenth-century *salons*, with those of Lord and Lady Holland. Its garden had also great horticultural interest, since the fourth Earl was a great botanist and the friend of Dr. Lindley, a past secretary of the Royal Horticultural Society. It was here that the *Dahlia variabilis* was first successfully raised, while the Cedars of Lebanon—both here and at St. Anne's Hill, Chertsey, once the country residence of members of the family—were remarkable for both size and beauty; indeed, he had been over the Lebanon and had seen no rivals of them. These high horticultural traditions were worthily maintained by Lady Ilchester, whose husband, the late Earl, had long been an able colleague on the Council of the R.H.S. The Summer Show, he said, was a record one, with more than 180 exhibitors, and notably rich in orchids, roses, begonias, herbaceous, and alpine plants, &c.

Mr. May proposed "The Chairman," which was received with acclamation.

JUDGES.

Orchids.

Chapman, H. J.
Fowler, J. Gurney
Little, H.
Wellesley, F.

Roses.

May, H. B.
Mease, W.
Philbrick, Miss
Willmott, Miss, V.M.H.

Carnations.

Blick, Chas.
Douglas, James, V.M.H.
Jennings, J.
Turner, Arthur

Fruit and Vegetables.

Challis, T., V.M.H.
Poupart, W.
Rollit, Sir Albert, LL.D.

GROUPS IN OPEN.

Beckett,E., V.M.H.
Chapman, A.
Thomas, Owen, V.M.H.
Wythes, Geo., V.M.H.

HARDY HERBACEOUS PLANTS.

Bedford, A.
Bowles, E. A.
Grandfield, J.
Shea, C. E.

ALPINE AND ROCK GARDENS.

Bilney, W. A.
Boscawen, Rev. A.
Divers, W. H.
Lynch, R. Irwin, V.M.H.

FOLIAGE PLANTS.

Bain, W.
Fielder, C. R.
Hudson, James, V.M.H.
McLeod, Jas. F.

OTHER FLOWERING PLANTS.

Bates, W.
Coomber, T.
Howe, W.
Reynolds, Geo.

PLANTS NOT INCLUDED IN ABOVE.

Dixon, C.
Notcutt, R. C.
Turner, T. W.

HORTICULTURAL SUNDRIES.

Davis, J.
Pearson, C. E.
Ware, W. T.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

Gold Medal.

The Duke of Portland (gr. Mr. J. Gibson), for fruit.

Sir Jeremiah Colman, Bart. (gr. Mr. Collier), for Orchids.

Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), for fruit and vegetables.

Leopold de Rothschild, Esq. (gr. Mr. J. Hudson, V.M.H.), for terrace plants.

Messrs. J. Carter, for a Japanese garden.

Messrs. W. Cutbush, for Carnations.

Messrs. H. B. May, for ferns.

Messrs. Paul, for Roses.

Messrs. W. Paul, for Roses.

Mr. Amos Perry, for Delphiniums.

Messrs. T. Rivers, for fruit trees in pots.

Mr. L. R. Russell, for trained Ivies and Water Lilies.

Messrs. Sander, for Orchids.

Messrs. Sutton, for Sweet Peas and Culinary Peas.

Messrs. J. Veitch, for greenhouse and stove foliage plants.

Messrs. R. Wallace, for an Old-English paved garden.

Silver Cup.

The Marquis of Salisbury (gr. Mr. H. Prime), for fruit.
Lord Llangattock (gr. Mr. T. Coomber), for Strawberries and Pineapples.
Sir Randolph Baker, Bart. (gr. Mr. A. E. Usher), for Sweet Peas.
S. Heilbut, Esq. (gr. Mr. G. Camp), for fruit trees in pots.
Cecil F. Raphael, Esq. (gr. Mr. A. Grubb), for Carnations and vegetables.
Messrs. Barr, for hardy flowers and Japanese pygmy trees.
Messrs. Blackmore & Langdon, for Begonias.
Messrs. G. Bunyard, for hardy flowers and Strawberries.
Mr. H. Burnett, for Carnations.
Messrs. B. R. Cant, for Roses.
Messrs. Charlesworth, for Orchids.
Messrs. J. Cheal, for Pergola with climbers and shrubs.
Messrs. G. & A. Clark, for ornamental shrubs and hardy flowers.
Messrs. W. Cutbush, for clipped trees, flowering and foliage plants.
Messrs. A. Dickson, for new Roses.
Mr. Hugh Dickson, for new Seedling Roses.
Messrs. Dobbie, for Sweet Peas.
Messrs. W. Fromow, for Japanese Maples.
Miss H. Hemus, for Sweet Peas.
Messrs. G. Jackman, for Roses, Clematis, and hardy flowers.
Messrs. S. Low, for Orchids, Roses, and Carnations.
Messrs. Mansell & Hatcher, for Orchids.
Mr. Maurice Prichard, for water garden.
Messrs. D. Russell, for hardy trees and shrubs.
Messrs. J. Veitch, for Carnations and flowering plants.
Messrs. T. S. Ware, for Begonias and alpines.

Silver-gilt Hogg Medal.

Leopold de Rothschild, Esq. (gr. Mr. J. Hudson, V.M.H.), for fruit.
Messrs. Laxton Bros., for Strawberries.

Silver-gilt Flora Medal.

E. J. Johnstone, Esq. (gr. Mr. Paskett), for Carnations and Sweet Peas.
Messrs. W. Artindale, for Violas, Roses, and hardy flowers.
Messrs. Frank Cant, for Roses.
Messrs. J. Cheal, hardy herbaceous alpine and rock garden.
Messrs. R. & G. Cuthbert, group of miscellaneous flowering plants.
Mr. A. F. Dutton, for Carnations.
Messrs. Hobbies, for Roses.
Mr. G. Lange, for Carnations.
Mr. Frank Lilley, for Gladioli.
Messrs. Paul, for hardy shrubs.
Messrs. J. Peed, for Caladiums, Gloxinias, and Carnations.

Silver-gilt Knightian Medal.

Mr. William Poupart, Junr., for bottled fruits

Silver-gilt Banksian Medal.

Messrs. R. H. Bath, for Carnations, Roses, and hardy flowers.
Mr. Bertie E. Bell, for Carnations.
Mr. C. Blick, for Carnations.
Messrs. Kelway, for Delphiniums and Sweet Peas.
The King's Acre Nurseries, for Sweet Peas.
Mr. R. C. Notcutt, for Roses and flowering shrubs.
Mr. W. H. Page, for Carnations, Roses, and Liliums.
Mr. G. Prince, for Roses.
Mr. G. Reuthe, for shrubs, alpine and rock plants.
Mr. C. Turner, for Roses and Carnations.
Mr. Carlton White, for topiary work.

Silver Flora Medal.

Lord Burnham (gr. Mr. G. Johnson), for Carnations.
Hon. Vicary Gibbs, for sweet-scented Pelargoniums.
H. S. Goodson (gr. Mr. G. E. Day), for Orchids.
Messrs. S. Bide, for Sweet Peas.
Mr. C. W. Breadmore, for Sweet Peas.
Messrs. Carter Page, for Zonal Pelargoniums, Dahlias, &c.
Mr. H. H. Crane, for Violas and Violettas.
Mr. H. N. Ellison, for ferns.
Mr. C. Engelmann, for Carnations.
Messrs. J. Forbes, for Phloxes and Pentstemons.
Messrs. Gunn, for new Phloxes.
Messrs. R. Harkness, for Roses.
Mr. H. Hemsley, for alpine and rock garden.
Misses Hopkins, for miscellaneous alpines.
Messrs. E. W. King, for Sweet Peas.
Messrs. Ladhams, for hardy perennials.
Mr. L. R. Russell, for stove plants.
Mr. W. J. Unwin, for Sweet Peas.
Messrs. J. Waterer, for evergreen shrubs.
Messrs. Whitelegg & Page, for rock plants and Sweet Peas.

Silver Knightian Medal.

Messrs. Le Lacheur & Sherris Henfield, for melons.
Mr. S. Mortimer, Farnham, for melons and cucumbers.

Silver Banksian Medal.

Rt. Hon. Colonel Lockwood, C.V.O. (gr. Mr. G. Craddock), for Tracheliums.
E. S. Hanbury, Esq. (gr. Mr. F. W. Church), for fruit.
Messrs. Bees, for new Primulas and herbaceous plants.
Messrs. W. & J. Brown, for Roses, Heliotropes, and Tracheliums.
Mr. Clarence Elliott, for alpines.

Messrs. G. Gibson, for hardy herbaceous plants.
Messrs. Godfrey, for *Amaranthus tricolor* and Sweet Peas.
Mr. A. Ll. Gwillim, for Begonias.
Messrs. H. J. Jones, for Sweet Peas and Pelargoniums.
Messrs. J. K. King, for Sweet Peas.
Messrs. G. Mallett, for Lilies, Irises, and Spiræas.
Messrs. J. Piper, for topiary work.
Mr. H. C. Pulham, for alpines and hardy flowers.
Messrs. Seagrave, for Violas.
Messrs. R. Sydenham, for Sweet Peas.
Messrs. Young, for Anemones, Lychnis, and Delphiniums.

Bronze Flora Medal.

Messrs. Bastock, for Violas and Galegas.
Guildford Hardy Plant Nursery, for hardy herbaceous flowers.
Mr. A. J. Harwood, for hardy herbaceous plants.
Messrs. Jarman, for Carnations, Centaureas, and Sweet Peas.
Messrs. G. Stark, for Sweet Peas.

HORTICULTURAL SUNDRIES.

Silver Flora Medal.

Messrs. C. & W. Buswell, for garden tents, seats, and hammocks.
Four Oaks Spraying Machine Co., for spraying machines.
Mr. Alex. Hamilton, for tubs for shrubs, seats, and tables.
Messrs. W. Wood, for horticultural sundries.

Silver Banksian Medal.

Alpha Extinguisher, for spraying machines.

Bronze Flora Medal.

Messrs. W. E. Chance, for bell glasses.
Messrs. B. Maggs, for teak garden seats.
Meath Home, for garden baskets.
Mr. John Pinches, for Rose exhibition boxes.
Mr. J. P. White, for garden seats.
Castle's Shipbreaking Co., for garden furniture.

GENERAL MEETING.

July 19, 1910.

Mr. E. A. Bowles, M.A., F.L.S., in the Chair.

Fellows elected (51).—Mrs. G. Beck, W. J. Brothers, Mrs. C. M. Browning, W. Burdett-Coutts, E. Caddick, R. Cornthwaite, Mrs. E. M. Edgar, R. English, Mrs. Arthur Evans, J. Firth, Lady C. Milnes Gaskell, A. R. Gould, C. H. Green, F. Griffiths, Mrs. B. Haughton, Dr. Thomas Hobson, F.Ph., Miss A. L. Hue, Howard James, R. M. C. James, Miss L. H. Johnson, Mrs. Johnson, Mrs.

Craven Jones, M. H. Keast, Miss M. M. Knowles, Mrs. A. J. McNeill, Mrs. Mason, R. G. Miller, Mrs. A. Naylor, G. Newman, H. Newman, J. B. O'Donoghue, J. Owen-Owen, R. M. Palmer, Lady Perceval, W. Richardson, Miss L. Robinson, G. C. Ronchetti, W. S. T. Saunders, E. I. Shadbolt, Mrs. F. M. Smart, Henry Smith, C. A. Spencer, Miss E. J. Stainforth, Mrs. A. Studenmund, W. Taylor, Rev. C. F. Townley, John Ward, Mrs. W. D. Waterhouse, Mrs. West, Mrs. W. H. Williams, T. Young.

Fellows resident abroad (2).—M. Ali Jeddy (India), Colonel K. N. Rana (India).

Associates (2).—F. Jeffreys, W. G. Lewcock.

A lecture on "Insects Affecting our Crops" was given by Mr. Fred. Enock, F.L.S., F.E.S. (see p. 322).

GENERAL MEETING.

August 2, 1910.

Sir Albert Rollit, LL.D., D.C.L., in the Chair.

Fellows elected (31).—John Barclay, G. E. Bate, Major-Gen. F. A. Bowles, C.B., A. A. Brand, A. S. Brooks, M. F. Burrows, F. S. Catherall, Sir Mark Collet, Bart., Mrs. Cordes, Mrs. F. B. Du Pre, Mrs. C. E. Eagles, Mrs. Jamieson, Mrs. Joy, F. C. Katon, Mrs. Knight, Mrs. C. H. Krabbe, Mrs. Lloyd, H. J. Martin, Mrs. H. H. Mulliner, A. Neve, Mrs. Russell Oliver, A. H. Pawson, Miss Polehampton, Mrs. Politzer, Lady Reckitt, Miss S. G. Rogers, Thomas Smith, Mrs. J. Stuart, Mrs. Thurston, W. M. Waddleton, A. Collings Wells.

Fellows resident abroad (2).—Mrs. J. W. Bakewell (Australia), J. W. Matthews (South Africa).

A lecture on "The Planning, Building, and Planting of Small Rock Gardens" was given by Mr. A. Clutton-Brock (see p. 331).

GENERAL MEETING.

August 16, 1910.

Mr. George Bunyard, V.M.H., in the Chair.

Fellows elected (22).—Mrs. T. H. Bingham, Miss H. Rothwell, Miss E. Ball, J. Crombleholme, H. W. Edwards, Stephen G. Fowler, Miss Glyn, Lady Heath, Mrs. R. Heinemann, W. F. Ireland, Miss G. Kay, Dr. John Lawrie, W. B. Ogilvie, W. C. Oliver, J. W. W. Openshaw, G. R. Phipps, A. W. Potter, R. O. Ridley, Mrs. John Taylor, E. W. Toms, T. Trotter, Mrs. H. Tuppen.

Fellow resident abroad (1).—G. H. Cave (India).

A lecture on "Some Little-known Grapes" was given by Mr. A. C. Smith (see p. 339).

GENERAL MEETING.

August 30, 1910.

Sir Albert Kaye Rollit, LL.D., D.C.L., in the Chair.

Fellows elected (3).—J. Whitton Aris, Alfred Roberts, Major C. E. Williams, M.D.

Fellows resident abroad (2).—A. E. P. Griessen (India), Frederic Street (British Columbia).

Society affiliated (1).—Somerset East Horticultural and Industrial Society.

A lecture on "The Effect of Overhead Electrical Discharges upon Plant Growth" was given by Mr. J. H. Priestley, B.Sc.

SCIENTIFIC COMMITTEE.

May 3, 1910.

Sir John T. D. Llewelyn, V.M.H., in the Chair, and ten members present.

The late Mr. G. S. Saunders.—A letter was read from Miss Saunders thanking the Committee for the vote of condolence passed by the Committee at the last meeting.

Seedlings of Saxifraga Rhei.—Mr. J. Fraser, F.L.S., showed and commented upon a number of seedling forms of *Saxifraga Rhei*, raised by Mr. C. Read, of Ealing. He thought it likely that *Saxifraga Rhei* was a form derived from *S. muscoides*, and that it was in a state of mutation. It had given seedlings of a variety of forms which had received different names, including *S.* 'Guildford Seedling,' forms of *S. decipiens* and so on. *S. Rhei* is found in a wild state in Transylvania, and members of the Committee considered it possible that the great extent of variation seen in the seedlings was due to segregation of hybrid characters.

Polyanthus, &c.—The Rev. Roland Upcher showed some varieties of Polyanthus which he had raised in his garden at Halesworth. They departed considerably from the florists' type of Polyanthus both in flower and leaf, but, in the opinion of most of the Committee, they showed no evidence of crossing with other species of *Primula*, pollen of which had been placed upon the stigmas of the parents. Mr. Upcher said no precautions had been taken to prevent the admission of foreign pollen. Mr. Bartleet, of Shooter's Hill, sent a semi-double flower of a yellow Auricula. Rev. J. Jacob showed a series of coloured Cowslip flowers.

Malformed Orchid.—Mr. L. Crawshay showed an inflorescence of the natural hybrid *Odontoglossum* × *Leeanum*, every flower malformed, all the petals, except the lip, being absent.

Scientific Committee, June 7, 1910.

Mr. E. A. Bowles, M.A., F.L.S., in the Chair, and nine members present.

Nomenclature of garden plants.—It was reported that the recommendations sent to the Horticultural Congress at Brussels, at which the R.H.S. was represented by Mr. Bowles, M.A., and Dr. Rendle, F.R.S., had been accepted with scarcely any modifications. These

recommendations followed the rules for the nomenclature of flowering plants passed at the Vienna Congress of 1905, with the additions necessary to make them apply to garden varieties and hybrids. They will be published *in extenso* in due course (see also pp. 405 and xcvi.).

Rose de Madera.—Sir Albert Rollit showed a specimen of the 'Rose de Madera' or 'Rose de Palo' from Guatemala. The specimen was a woody growth somewhat resembling an open Rose about 3 inches in diameter, at the end of a branch about 1½ inch in diameter. These formations are the result of the attack of a parasite, in this case probably a species of *Phoradendron*, on a flowering plant, inducing a considerable development of tissue in the host. Later, the parasite dies and decays, leaving the tissue of the host intact, showing the impressions where the sucker-like organs of the parasite were in intimate contact with the host. The growths are well figured in Engler's "Pflanzenfamilien," Abt. I., p. 161.

Fungus on roof.—Mr. Hales showed a specimen of a fungus which was growing in quantity, depending from the roof of Chelsea Old Church. Dr. Rendle took it for further examination (see p. cxvi.).

Saxifraga Geum, &c.—Mr. Fraser showed seedlings of *Saxifraga Geum* var. *Colvillei*, illustrating the great range of variability possessed by seedlings, and the probability of the hybrid origin of some forms. There were seventy-eight seedlings in all, of which some had yet to flower. Of those that had flowered three were like the seed-parent, two were hybrid forms of *S. umbrosa*, twenty were broad-leaved forms of *S. Geum dentata*, two had the primary flowers ½ inch in diameter, seventeen had creamy-white ovaries, two were like *S. Geum elegans*, and five were like *S. Geum serrata*. Considerable difficulty was often experienced in classifying the forms of this section, since the plants produce two sets of leaves, unlike one another, in the spring and autumn respectively, and botanists had described foliage without reference to the season.

Iris with bearded standards.—Mr. Bowles drew attention to an Iris shown by Mr. Perry, a seedling raised by the late Sir Michael Foster, having the spathe valves of *Iris pallida*, and probably a seedling from that species, but with a forked stem. The standards were somewhat drooping instead of being erect, and each had on its upper surface a small amount of bearding similar to that on the falls, but less in extent.

Hybrid Primulas.—Messrs. Veitch sent hybrids of *Primula pulverulenta* and *P. Cockburniana*, together with the parents for comparison. The series was as follows:—

1. *P. pulverulenta* ♀ × *P. Cockburniana* ♂ = *P.* × 'Unique'; and (2) the reciprocal cross, giving *P.* × 'Unique' and *P.* × 'Unique improved.'

3. *P. Cockburniana* ♀ × *P.* 'Unique' ♂ = *P.* × 'Excelsior.' This form has bright flowers nearly approaching *P. Cockburniana*, but distinct and, like the other two before mentioned, perennial, whereas *P. Cockburniana* is biennial.

4. *P. pulverulenta* ♀ × *P.* × ' Unique ' ♂ = an unnamed form approaching *P. pulverulenta* in colour, but of a shade intermediate between its two parents.

5. *P.* × ' Excelsior ' ♀ × No. 4 ♂ = an unnamed seedling almost exactly like *P.* × ' Unique,' and as its history shows, the result of combining *P. pulverulenta* and *P. Cockburniana* in equal proportions.

6. *P.* × ' Excelsior ' ♀ × *P. Cockburniana* ♂ = an unnamed seedling almost identical with *P. Cockburniana*, but whether perennial or not has not yet been ascertained.

Cheiranthus hybrid.—Mr. J. S. Arkwright, D.L., M.P., of Lyonshall, Herefordshire, sent a hybrid between *Cheiranthus Allionii* ♀ and *C. alpinus*. Five or six flowers had been crossed by him in 1908, but only one pod, and from that only one plant, had been obtained. The plant was very vigorous, being bushy, and measuring about 18 inches through; it had been flowering for a month. The flowers were bright orange, but not so deep as those of *C. Allionii*. In the bud they were dark purple, like those of *C. alpinus*, contrasting markedly with the orange-coloured flower. The plant was shown under the name *C.* × *Arkwrightii*. It may be increased readily by cuttings.

Crocus sativus.—In reply to a request for information regarding the cultivation of the Saffron Crocus, Mr. A. W. Hill, M.A., sent the following report:—

The Saffron Crocus is said to have been introduced into England during the reign of Edward III. (A.D. 1327-1377). Two centuries later English Saffron was even exported to the Continent, for in a priced list of the spices sold by apothecaries of the north of France, A.D. 1565-1570, mention is made of three sorts of Saffron, of which ' Safren d'Engleterre ' is the most valuable. It was evidently produced in considerable quantities, for in 1682 we find in the tariff of the *Apotheke*, of Celle, Hanover, *Crocus austriacus optimus*, and *Crocus communis anglicus*.

In the beginning of the eighteenth century (1723-28), the cultivation of Saffron was carried on in what is described by a contemporary writer as "all that large tract of ground that lies between Saffron Walden and Cambridge, in a circle of about ten miles diameter." The same writer remarks that Saffron was formerly grown in several other counties of England. The cultivation of the Crocus about Saffron Walden, which was in full activity in 1594, had ceased in 1768, and about Cambridge at nearly the same time. Yet it must have lingered in a few localities, for in the early part of the nineteenth century a little English Saffron was still brought every year from Cambridgeshire to London, and sold as a choice drug to those who were willing to pay for it.

At the present day this product is chiefly produced in Spain, the commercial variety distinguished as Best Valencia realizing from 42*s.* to 42*s.* 6*d.* per lb. (April 23 last).

According to the latest reports from Spain, supplies are difficult to obtain, and as a large proportion of the bulbs have been destroyed

by drought, the outlook for the next crop is serious. A considerable quantity of Saffron is annually produced in Persia, but little or none of this finds its way into European commerce.

Scientific Committee, June 21, 1910.

J. T. Bennett-Poë, Esq., M.A., in the Chair, and nine members present.

Fungus on roof.—It was reported that the fungus shown at the last meeting from the roof of Chelsea Church was *Coprinus radians*.

Saxifraga umbrosa.—Mr. J. Fraser, F.L.S., showed seedlings of a compact form of *Saxifraga umbrosa* with prettily-spotted flowers, differing from the type in stature and in the closeness of the rosettes. The seedlings came true in habit, but showed some variation in the spotting of the flowers.

Cross-bred Pinks.—Mr. Douglas, V.M.H., showed a large number of flowers of seedlings, the result of crossing the ordinary white form with the pink called 'Rubican.' The seedlings showed in a marked manner the influence of the latter, and some very beautiful forms were among them; 10 to 12 per cent. of the seedlings bore single flowers, and no fringed flowers were among the singles.

Coloration of Sweet Pea tendrils, &c.—Mr. Cuthbertson showed Sweet Pea growths in flower for the purpose of showing that the coloration of the tendrils and axils cannot in every case be accepted as one of the guides to purity of stock. The variety 'Mrs. Hugh Dickson' gives both green and coloured tendrils and axils. The old variety, 'Lady G. Hamilton,' behaves in a similar way. Mr. Ireland, Messrs. Dobbie's Sweet Pea grower, says that seed saved from a green-tendrilled plant gives, when grown, both colours in the first generation. It was at one time thought that the presence or absence of colour in the axils and tendrils of Sweet Peas might serve to enable "roguing" to be done at an early stage, but although this is frequently true it is evident that this unit character would have to be selected and bred for like any other before it would prove a trustworthy guide.

Scientific Committee, July 19, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Saxifraga tellimoides.—Mr. Fraser, F.L.S., showed a plant of *S. tellimoides* and commented upon its peculiarities. It is a native of Japan, and has affinities with the American *S. peltata* and with *S. Jamesii*, which is also American, but it agrees with none of the recognized sections completely. It is perhaps nearest the section Isomeria, but differs in the peltate leaves. This species was discovered by Maries in 1880, first flowered in this country in 1885, fertile seed

being produced in 1892. It was put into commerce by Messrs. Vilmorin in 1897.

Seminal variation in Campanula lactiflora.—Mr. Bowles showed seedlings of *Campanula lactiflora* having abnormally narrow leaves and very narrow petals, the corolla being cut almost to the base. One had blue flowers, and had been derived from a blue-flowering plant; the other bore white flowers, and had occurred near a clump of the white form. The variation was in the same direction as that seen in the variety of *C. rotundifolia*, known as *soldanellioides*.

Spiraea Aruncus.—Mr. Bowles also showed a specimen of *Spiraea Aruncus*, bearing both staminate and hermaphrodite flowers. Up to the present only the staminate form has been known in his garden.

Scientific Committee, August 2, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Phlox sporting.—Mr. Douglas, V.M.H., showed flowers from the plants shown on August 31 last year which until then had produced white flowers, but were then flaked with lilac. These plants had been carefully marked, and had this year produced flowers almost entirely white, but with slight touches of lilac in them. The calyx was purple.

Aberrations in Antirrhinum.—Mr. W. Hales showed a variety of aberrations in the common *Antirrhinum*, consisting mostly of flowers tending to become regular. In one case the terminal flower had become completely peloric, and on the same shoot the normal corolla had at its base an anterior outgrowth very like the palate in form and colouring.

Gall on Willow.—Mr. Bowles showed examples of galls on willow (*Salix alba*) from Enfield similar to those shown from the neighbourhood of Buckhurst Hill by Mr. Chittenden in October 1906. The galls are apparently formed through the irritation set up by a mite (*Eriophyes salicis*), causing the repeated branching of a shoot which produces small and narrow, rather soft leaves, so that the whole mass measures up to a foot in length and nine inches in diameter. The growth turns bright red in autumn.

Scientific Committee, August 16, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Dimerous Iris.—Mr. Fawcett, B.Sc., F.L.S., sent a flower of *Iris Xiphium* having all its parts in twos instead of threes. This type of variation from the normal in Iris is fairly common, but is often confined to one or two whorls instead of all four. The stem also bore a bud, but in that the parts of the flower were in threes.

Sporting in Carnations.—Mr. J. Douglas, V.M.H., called attention to the variation in colour met with in Carnation "Rhoda," which,

when it was first sent out, was marked with lavender and red on a white ground. It had this year sported in two or three places to a lavender-ground flower. He remarked upon the frequency with which sudden colour sports appeared in more than one locality in the same plant at the same time. Several other instances were remarked upon by other members of the Committee.

Salices.—Mr. Fraser, F.L.S., showed specimens of *Salix alba* (the Bat Willow) and called attention to the form of the serration of the leaves; though the latter vary in size, the serrations are always of similar form. He showed also *S. fragilis britannica*, which has irregular serrations to the leaves, and the hybrid, *S. viridis*, in which the foliage is intermediate between the other two. In the hybrid the leaves are dark green above, and their under surfaces are whiter than those of *S. fragilis*; the serrations are intermediate in form and more regular than in *fragilis*.

Spotting of Calanthe foliage.—Plants of *Calanthe* vars. were shown badly attacked by a spot disease. So far as has yet been definitely ascertained, the spotting is not caused by a fungus or other organism, and appears not to be infectious. It seems rather to be due to some cultural defect, perhaps to spraying with cold water.

SCIENTIFIC COMMITTEE, AUGUST 30, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Garden Warblers attacking Plums.—Mr. Worsley said that garden warblers were this year attacking the ripening Plums on the trees, contrary to their usual habit. Mr. Gordon, V.M.H., suggested that this may be due to lack of insects—their usual food—this season, and instanced an experiment with hawks whose tastes he had trained till they preferred fruit as a food.

Aberrant Branching in Mentha.—Mr. Fraser, F.L.S., showed a plant of *Mentha gentilis variegata* bearing one pair of leaves united by their petioles and half the edges of the lamina. The axillary branches were also on one side, following the leaves. The main axis formed a right-angle to its base, flattened above and convex beneath like a petiole. Then it bore one leaf with an axillary shoot, and then the axis resumed its upright position with opposite, decussate leaves. Three nodes below also had a single or twin-leaf on one side, and one lateral branch behaved in the same way.

Petaloid Calyx in Rose.—A specimen of Rose 'Eugenie Lamesch' was also submitted by Mr. Fraser to show phylloid sepals and median proliferation of the flower. The axis in the centre of the flower was prolonged, bearing another flower-bud.

Oncidioda × *Charlesworthii.*—The first cross of an *Oncidium* with *Cochlioda* (*O. incurvum* × *C. Noezliana*) was shown by Messrs. Charlesworth, of Haywards Heath. The specimen submitted was one

of several of the same raising, all of which showed the same characteristics and colouring. The habit of the plant was intermediate between the two parents. Inflorescence not short and curved as in *Cochlioda Noezliana*, but slender and elongated (about 2 feet 6 inches) as in *Oncidium incurvum*. Flowers about 1 inch across. Sepals and petals light mauve, lanceolate, nearly equal, somewhat reflexed. Lip three-lobed, constricted in the middle between the front and side lobes, pale rose. Crest toothed or spiny, yellow. It is curious that the purple colour in the flowers of *O. incurvum* has obliterated the orange-red of *Cochlioda Noezliana*. A Certificate of Appreciation to Messrs. Charlesworth was recommended.

Rhododendron ponticum.—Mr. Bowles showed a terminal bud of *Rhododendron ponticum*, the leaves having petaloid coloration.

Adventitious Root of Plane Tree.—Rev. W. Wilks sent an adventitious root of a Plane tree which he had found penetrating a straw stake-band 6 feet from the ground. It was thought that the moisture which had been held by the band had induced the formation of the root.

Grapes.—A sample of Muscat Grapes was submitted from Colonel Turnor, of Pinkney Park, which showed cracking and decay at the point of union of berry and stalk, and the leaves were badly spotted. It was agreed that the defects were due to too low a temperature in the house, with insufficient ventilation.

Decayed Montbretia Foliage.—Some Montbretias, Irises, and Gladioli having decayed foliage were sent by Mr. Edward Hall, of Leamington Spa. The bulbs and corms were apparently in good health, without traces of disease. Many similar specimens had been lately received, but up to the present no explanation of the trouble was forthcoming.

FRUIT AND VEGETABLE COMMITTEE.

MAY 3, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Silver Knightian Medal.

To Lord Stanhope, Sevenoaks, for Grapes and Strawberries.

FRUIT AND VEGETABLE COMMITTEE, JUNE 7, 1910.

Mr. A. H. PEARSON in the Chair, and eighteen members present

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Jas. Veitch, Chelsea, for vegetables.

Other Exhibits.

Messrs. Low, Bush Hill Park: Lowberry.
Mr. S. Mortimer, Farnham: Cucumber 'Aviator.'
Mr. Palmer, Andover: Peach 'Edward VII.'

FRUIT AND VEGETABLE COMMITTEE, JUNE 21, 1910.

Mr. JOSEPH CHEAL in the Chair, and thirteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. J. Veitch, Chelsea, for fruit trees in pots.

Silver Knightian Medal.

To Messrs. Geo. Bunyard, Maidstone, for cherry trees in pots.

Award of Merit.

To Strawberry 'Mark Twain' (votes, unanimous), from Mr. T. B. White, Southampton. Fruit conical, of medium size, bright red, solid, red flesh, seeds yellow and depressed in the fruit, flavour very rich and good. The plant is stated to be a great bearer, and of excellent constitution.

Cultural Commendation.

To Mr. James Vert, Saffron Walden, for Strawberries.

Other Exhibits.

Messrs. Laxton, Bedford: Strawberries.
Mr. T. E. Smiles, Welmington: Strawberry 'Excelsior.'
The Marquis of Salisbury, Hatfield: Melon.

FRUIT AND VEGETABLE COMMITTEE, JUNE 30, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. ALEX. DEAN, V.M.H., in the Chair, and six members present.

The following Peas, Lettuce, and Radishes were recommended for the inspection of the full Committee at their next meeting.

* Peas.—12, 'Dawn'; 14, 'Duchess of York'; 38, 'Harbinger'; 39, 'Hundred-fold'; 45, 'Laxtonian' (re-selected); 62, 'Early Duke'; 64, 'Snowdrop'; and 71, 'Victor.'

* Lettuce.—9, 'Commodore Nut.'

* Radishes.—13, 'Long Brightest Scarlet' and 28, 'Jewel.'

FRUIT AND VEGETABLE COMMITTEE, JULY 5, 1910, AT HOLLAND PARK.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Award of Merit.

To Pea 'Hundred-fold,' from Messrs. Sutton.
To Pea 'Laxtonian' (re-selected), from Messrs. Carter.
To Pea 'Early Duke,' from Messrs. Carter.
To Pea 'Victor,' from Messrs. J. Veitch.

The other varieties put before the Committee had previously received awards.

To Cabbage Lettuce 'Commodore Nut,' from Messrs. Sutton.
To Radish 'Long Brightest Scarlet,' from Messrs. Nutting.
To Radish 'Jewel,' from Messrs. Barr.

All the above were from the trials at Wisley.*

Other Exhibits.

A. Hibberd, Esq., Botley: Strawberry 'Superlative' and Strawberry 'George V.'
Mr. F. Fleetwood Paul, Botley: Tomato 'Paul's No. 1.'

* For descriptions see Reports of Wisley Trials.

FRUIT AND VEGETABLE COMMITTEE, JULY 19, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Veitch, Chelsea, for a collection of fruit trees in pots.*

Silver-gilt Knightian Medal.

To Messrs. Bunyard, Maidstone, for a collection of fruit trees in pots.

To Messrs. Veitch, Chelsea, for a collection of vegetables.

Bronze Banksian Medal.

To the Church Army Experimental Gardening Association, London, for a collection of vegetables.

Other Exhibits.

Mr. G. Ferguson, Kendal: Melon 'Sedgwick Gem.'

Misses Le Lacheur and Sherris, Henfield: Melon 'Marchioness of Tweeddale.'

FRUIT AND VEGETABLE COMMITTEE, JULY 26, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and six members present.

The following Peas, Lettuces, Potatos, and Tomatos were recommended for the inspection of the full Committee at their next meeting.

Peas.—103, 'Prestige'; 105, 'Prince of Peas'; 109, 'Stratagem'; 110, 'Superlative'; 113 and 114, 'Telephone'; 122, 'Moneymaker'; 126, 'Alderman'; 142, 'Duke of Albany'; 158, 'International.'

Lettuces.—11, 'Duke of Cornwall'; 13, 'Early Open Air'; 20, 'Green Favourite'; 23, 'Heartwell'; 25, 'Icehead'; 28, 'Ideal'; 45, 'Supreme'; 52, 'White Favourite'; 54, 'The New Yorker'; 64 and 65, 'Jumbo'; 68, 'Paris Grey.'

Potatos.—4, 'Selected Ashleaf'; 5, 'Ashleaf'; 7, 'Ashleaved Kidney'; 9, 'Pride of Devon'; 16, 'May Queen'; 17, 'Walker's Seedling'; 19, 'Faithlie'; 22, 'Lady Llewelyn'; 30, 'Ninetyfold'; 31, 'Epicure'; 46, 'Dew's Favourite Improved.'

Tomatos.—11, 'Balch's Carrick,' and 12, 'Balch's Ailsa Craig.'

For descriptions see Reports of Wisley Trials.

* The Committee wish to express their appreciation of the cultural skill shown in producing these trees.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 2, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and seven members present.

Awards Recommended:—

Award of Merit.

To Lettuce 'Green's Favourite,' from Messrs. Barr, Covent Garden.

To Lettuce 'Heartwell,' from Messrs. Sutton, Reading.

To Lettuce 'Icehead,' from Messrs. Barr, Covent Garden.

To Lettuce 'Supreme,' from Messrs. Sutton, Reading.

To Lettuce 'White Favourite,' from Messrs. Barr, Covent Garden.

To Pea 'Moneymaker,' from Messrs. J. K. King, Coggeshall.

To Pea 'Prestige,' from Messrs. J. Veitch, Chelsea.

To Pea 'Prince of Peas,' from Messrs. Sutton, Reading.

To Potato 'Dew's Favourite,' from Mr. A. A. Dew, Coalville.

To Potato 'Faithlie,' from Messrs. Smith, Aberdeen.

To Potato 'Selected Ashleaf,' from Messrs. Barr, Covent Garden.

To Potato 'Walker's Seedling,' from Mr. Brewer, Nailsworth.

All the above were from the trials at Wisley. For descriptions see Reports of Wisley Trials.

Other Exhibits.

Mr. G. Brown, Hull: seedling Raspberry.

Messrs. Dobbie, Edinburgh: Cabbages.

Mr. G. Kent, Dorking: Melon 'Norbury Seedling.'

Messrs. Spooner, Hounslow: Apple 'Early Red Margaret.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 16, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for fruit trees in pots.

Award of Merit.

To Maincrop Pea 'Exhibition' (votes, unanimous), from Messrs. Carter, High Holborn.

To Maincrop Pea 'Magnum Bonum' (votes, unanimous), from Messrs. Barr, Covent Garden.

To Maincrop Pea 'Satisfaction' (votes, unanimous), from Messrs. Sutton, Reading.

To Maincrop Pea 'Windsor Castle' (votes, unanimous), from Messrs. Sutton, Reading.

To Maincrop Pea 'Yorkshire Hero' (votes, unanimous), from Messrs. Sutton, Reading.

To Melon 'Early Favourite' (votes, unanimous), from Mr. A. C. Smith, R.H.S. Gardens, Wisley.

For descriptions of the above, see Report of Wisley Trials.

Other Exhibits.

Mr. Balch, Girvan: Tomatos.
J. McGregor, Esq., Hailsham: Melon.
L. Salomons, Esq.: Peach 'Thames Bank.'
G. F. Scott-Elliot, Esq., Newton: Potatos.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 30, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver-gilt Banksian Medal

To Messrs. Spooner, Hounslow, for Apples.

Silver Knightian Medal.

To Lord Northcliff, Guildford, for a collection of Melons.

To A. Nix, Esq., Crawley, for twelve bunches of Black Hamburg Grapes.

Silver Banksian Medal.

To Sir Robert Harvey, Bart., for large and deliciously flavoured Mangos, grown at Langley Park, Slough.

To Messrs. J. Veitch, Chelsea, for a collection of Capsicums.

Award of Merit.

To Melon 'Golden Beauty' (votes, 10 for, 4 against), from Messrs. Barr, Covent Garden. Fruit oval, large, bright yellow, well netted, flesh orange coloured, very fleshy and juicy, and of good flavour.

To Tomato 'Balch's Ailsa Craig' (votes, unanimous), from Mr. Balch, Girvan.

To Tomato 'Balch's Carrick' (votes, unanimous), from Mr. Balch, Girvan.

To Tomato 'Balch's Ayrshire' (votes, unanimous), from Mr. Balch, Girvan.

For descriptions of these Tomatos, see Report of Wisley Trials.

Other Exhibits.

G. Dyke, Esq., Milborne Port: Apple 'Annie Elizabeth.'
Hon. Vicary Gibbs, Elstree: *Chenopodium amaranticolor.*
S. Lloyd, Esq., Droitwitch: seedling Potato.
Mr. G. Miller, Wisbech: Apples.

FLORAL COMMITTEE.

May 3, 1910.

Mr. H. B. May in the Chair, and twenty-nine members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for greenhouse plants, shrubs, &c.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cutbush, Highgate, for Carnations, &c.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Mr. A. Perry, Enfield, for hardy plants.
To Messrs. T. S. Ware, Feltham, for hardy plants.

Silver Banksian Medal.

To Messrs. Bakers, Codsall, for hardy plants.
To Mr. H. Burnett, Guernsey, for Carnations.
To Burton Hardy Plant Nurseries, Christchurch, for alpines.
To Mr. G. H. Cuthbert, Southgate, for forced shrubs.
To Messrs. Dobbie, Rothesay, for Violas.
To Messrs. Garaway, Bristol, for Schizanthus.
To Messrs. Low, Bush Hill Park, for Carnations, &c.
To Messrs. May, Edmonton, for hardy ferns.
To Messrs. Mount, Canterbury, for Roses.
To W. Noakes, Esq., Croydon, for Schizanthus.
To Messrs. Peed, Streatham, for Maples, Gloxinias, &c.

Bronze Flora Medal.

To Misses Hopkins, Shepperton, for hardy plants.
To Messrs. Jackman, Woking, for hardy plants.
To Mr. W. H. Page, Hampton, for Carnations, &c.

Award of Merit.

To *Anemone nemorosa Alleni* (votes, 15 for, 3 against), from Mr. A. Perry, Enfield. Flowers very large, deep lavender. A decided improvement on *A. nemorosa Robinsoniana*.

To Auricula 'Canary Bird' (votes, unanimous), from Mr. J Douglas, Bookham. Flowers large, of good form, rich chrome-yellow. A fancy variety.

To Auricula 'Dorothy Cutts' (votes, 13 for), from Mr. Douglas. Flowers smaller than the above, pale yellow, tinged at the edge with rose. A fancy variety.

To Auricula 'May' (votes, unanimous), from Mr. Douglas. Flowers of good form and substance, with a dense circular paste.

To Carnation 'Mrs. C. T. Raphael' (votes, unanimous), from Mr. H. Burnett, Guernsey. A perpetual-flowering variety, with large pink flowers (fig. 128).

Fig. 128.—Carnation 'Mrs. C. T. Raphael.' (*Burnett.*)

To *Hydrangea Hortensia* 'Madame Emile Mouillère' (votes, unanimous), from Monsieur E. Moullière, Vendôme, France. Flowers large, borne on a good truss, pure white.

To *Hydrangea Hortensia* ' Ornament ' (votes, 12 for, 4 against), from Messrs. J. Veitch, Chelsea. Flowers of medium size, crenate edged, pale rose, truss compact.

To *Macleania insignis* (votes, 12 for, 1 against), from Messrs. J. Veitch, Chelsea. Flowers cylindrical, orange-scarlet; the young growths are a vivid red and are quite as valuable for decoration as the flowers. The plant requires an intermediate house.

To *Osmunda palustris crispato-congesta* (votes, unanimous), from Messrs. May, Edmonton. Plant very dwarf and dense, the young fronds of a bronzy hue.

To Polyanthus ' Ladham's Brilliant ' (votes, 14 for, 1 against), from Messrs. Ladhams, Southampton. Flowers very large, of good form, very freely produced, deep scarlet.

To *Schizanthus* ' Veitch's grandiflora hybrids ' (votes, unanimous), from Messrs. J. Veitch, Chelsea. Plants of very compact habit; flowers large, including all shades, many beautifully marked.

Other Exhibits.

R. Barclay, Esq., Dorking: *Hippeastrum* ' Robert.'
Messrs. Barr, Covent Garden: hardy plants.
Cosmo Bevan, Esq., Bromley: *Calceolaria Widmorei.*
Messrs. W. Brown, Stamford: Marguerite ' Perfection.'
Messrs. Cannell, Swanley: Pelargoniums.
Messrs. F. Cant, Colchester: Roses.
Messrs. Carter, Holborn: alpines.
Mr. F. H. Chapman, Rye: Freesias.
Messrs. J. Cheal, Crawley: flowering shrubs.
Messrs. Clark, Dover: hardy plants.
Messrs. Cocker, Aberdeen: *Trollius.*
Mr. Jas. Douglas, Bookham: *Myosotidium nobile.*
Mrs. Lloyd Edwards, Llangollen: hardy plants.
Mr. C. Elliott, Stevenage: hardy plants.
W. L. Fox, Esq., Falmouth: *Cistus* sp.
Messrs. Gilbert, Bourne: Anemones.
H. S. Gower, Esq., Trowbridge: Carnations.
Guildford Hardy Plant Nursery: hardy plants.
Messrs. Gunn, Birmingham: alpines.
Messrs. Heath, Cheltenham: alpines.
Mr. H. J. Jones, Lewisham: Polyanthus.
Mr. G. Kerswill, Exeter: *Gentiana acaulis.*
Messrs. Carter Page, London Wall: Violas and annuals.
Mr. G. Paul, Cheshunt: shrubs.
Mr. G. Prince, Longworth: Roses.
Mr. H. C. Pulham, Stansted: alpines.
W. Raphael, Esq., Dorking: *Myosotis* ' Marie Raphael.'
Mr. G. Reuthe, Keston: hardy plants.
E. Roberts, Esq., Llangollen: *Saxifraga sanguinea superba.*
Messrs. L. R. Russell, Richmond: *Clematis.*

Messrs. Sutton, Reading: Cinerarias.
Mr. Turner, Slough: hardy plants.
Rev. A. R. Upcher, M.A., Halesworth: Polyanthus.
Messrs. Wallace, Colchester: hardy plants.
C. F. Waters, Esq., Balcombe: Carnation 'Edith Waters.'
Hon. G. W. Wynn, Wakefield: *Amaryllis* seedling.

FLORAL COMMITTEE, TEMPLE SHOW, MAY 24, 1910.

Mr. W. MARSHALL, V.M.H., and twenty-four members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. xcviii.]

Awards Recommended:—

Award of Merit.

To *Azalea* 'Florodora' (*mollis* × *sinensis*) (votes, unanimous), from Messrs. Cuthbert, Southgate. Flowers large, borne on good trusses, orange-yellow, spotted with greenish-yellow.

To *Begonia* 'Rose Queen' (votes, 8 for), from Messrs. Blackmore & Langdon, Bath. Flowers large, double, of good substance, deep rose; petals entire (fig. 129).

To *Cytisus* × *Dallimorei* (votes, unanimous), from the Royal Gardens, Kew. A hybrid between *C. albus* and *C. scoparius* var. *Andreanus*. The habit and the size and shape of the flowers follow *C. albus*, but the colour is pale pink, with a crimson blotch on the wings.

To Marguerite 'Mrs. F. Sander' (votes, unanimous), from Messrs. Sander, St. Albans. Flowers large, double, dense, pure white, freely produced.

To *Rhododendron* 'Alice' (votes, unanimous), from Messrs. J. Waterer, Bagshot. Flowers large, rosy-pink, with a pale zone in the centre of each petal.

To *Rhododendron* 'Princess Juliana' (votes, 12 for, 1 against), from Messrs. J. Waterer. Flowers large, on good trusses, white, edged with pink.

To *Rhus typhina laciniata* (votes, 10 for), from Mr. R. C. Notcutt, Woodbridge. A light, cut-leaved variety.

To Rose 'Duchess of Westminster' (votes, 14 for, 3 against), from Messrs. A. Dickson, Newtownards. A Hybrid Tea, with well formed flowers of a soft pink colour. (Fig. 130.)

To Rose 'Excelsa' (votes, unanimous), from Messrs. G. Paul, Cheshunt. Flowers large, double, deep rosy-pink, borne in pendulous bunches. A vigorous-growing Wichuraiana variety. (Fig. 131.)

To *Sarracenia* × *Willmottae* (votes, unanimous), from Mr. A. J. Bruce, Manchester. Pitchers about 1 foot high, lid very broad, deep green, veined with red. A hybrid *S. Stevensii* × *S. purpurea*.

Other Exhibits.

Messrs. Artindale, Sheffield: *Primula Artindaliana.*
Messrs. Bakers, Codsall: hardy plants.

Fig. 129.—Begonia 'Rose Queen.' (*Blackmore & Langdon.*)
(p. cxxviii.)

Messrs. Bees, Liverpool: hardy plants.
Messrs. Brown, Stamford: Marguerites.
Mr. Burnett, Guernsey: Carnation 'Countess of March.'

Messrs. Cocker, Aberdeen: Trollius.
Messrs. Cuthbert, Southgate: Azaleas.
Mrs. Lloyd Edwards, Llangollen: hardy plants.
Messrs. Gibson: *Verbascum* 'Caledonia.'
Messrs. Hill, Edmonton: *Nephrolepis Scholzelii.*
Messrs. Hobbies, Dereham: Roses.

FIG. 130.—ROSE 'DUCHESS OF WESTMINSTER.' (*Gardeners' Magazine.*)
(p. cxxviii.)

Messrs. S. Low, Enfield: Carnation 'Princess Juliana.'
Messrs. May, Edmonton: Stock 'Chingford Rose.'
Mr. W. R. Newport, Uxbridge: Pelargonium 'Rose Queen.'
Messrs. Paul, Waltham Cross: Roses.
Mr. A. Perry, Enfield: hardy plants.
Messrs. Redlands, Emsworth: Carnation 'Stirling Stent.'

Mr. C. B. Robinson, Cheltenham: Carnations.
Messrs. Rochford, Turnford: *Polypodium sporadocarpum cristatum.*
Herr A. Toeffaert, Gendbrugge: Hydrangeas.

Fig. 131.—Rose 'Excelsa.' (*Gardeners' Magazine.*)
(p. cxxviii.)

Messrs. J. Veitch, Chelsea: miscellaneous plants.
Mr. C. F. Waters, Balcombe: Carnation 'Edith Waters.'

FLORAL COMMITTEE, JUNE 7, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended:—

Gold Medal.

To Messrs. T. Rochford, Broxbourne, for rambler Roses.

Silver-gilt Flora Medal.

To Mr. A. T. Paskett, Groombridge, for Malmaisons and Sweet Peas.

To Messrs. J. Veitch, Chelsea, for greenhouse plants.

Silver-gilt Banksian Medal.

To Miss H. Hemus, Upton-on-Severn, for Sweet Peas.

To Mr. Amos Perry, Enfield, for hardy plants.

To Messrs. L. R. Russell, Richmond, for stove and greenhouse plants.

Silver Flora Medal.

To Messrs. Wm. Cutbush, Highgate, for hardy plants.

To Messrs. W. H. Page, Hampton, for Roses, Liliums, &c.

To Mr. Maurice Prichard, Christchurch, for hardy plants.

To Messrs. J. Waterer, Bagshot, for Rhododendrons.

Silver Banksian Medal.

To Mr. C. Blick, Hayes, for Carnations.

To Messrs. Dobbie, Edinburgh, for Aquilegias.

To King's Acre Nurseries, Hereford, for Heliotropes.

To Mr. Frank Lilley, Guernsey, for Irises.

To Messrs. Stuart Low, Bush Hill Park, for Carnations, &c.

To Messrs. H. B. May, Edmonton, for flowering plants and ferns.

To Messrs. Geo. Mount, Canterbury, for Roses.

To Mr. G. Reuthe, Keston, for alpines and rare shrubs.

To Messrs. R. Veitch, Exeter, for choice shrubs.

To Messrs. R. Wallace, Colchester, for Irises.

To Messrs. T. S. Ware, Feltham, for hardy plants.

Bronze Flora Medal.

To Messrs. Geo. Bunyard, Maidstone, for hardy plants.

To Messrs. Paul, Cheshunt, for climbing Roses, &c.

To Messrs. Wm. Paul, Waltham Cross, for Roses.

To Messrs. Peed, Norwood, for Gloxinias and alpines.

To Mr. C. Turner, Slough, for Poppies.

Bronze Banksian Medal.

To Messrs. Cannell, Swanley, for hardy plants.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Clark, Dover, for hardy plants.
To Miss Hopkins, Shepperton, for alpines.
To Messrs. Geo. Jackman, Woking, for hardy plants.
To Messrs. Kelway, Langport, for Pyrethrums.
To Messrs. W. Artindale, Sheffield, for Violas and hardy plants.

Award of Merit.

To Carnation 'Edith Waters' (votes, unanimous), from Mr. C. F. Waters, Balcombe. A large-flowered tree variety, having blooms of bright cerise borne on long stiff stems. The calyx showed an inclination to split.

To Carnation 'Mrs. E. Martin Smith' (votes, unanimous), from Mr. C. Blick, Hayes. A large, pure white border carnation with a slight fragrance. The stems appeared to be rather weak.

To Carnation 'Queen Mary' (votes, unanimous), from Messrs. W. Cutbush, Highgate. A cross between border carnation 'Agnes Sorrel' and tree carnation 'The President,' having large deep maroon-crimson flowers strongly clove-scented. The stems were strong and the calyx good.

To *Clivia* 'King George V.' (votes, unanimous), from Mr. Miller, Wisbech. A honey-yellow flowered variety.

To Heliotrope 'Favourite' (votes, unanimous), from the King's Acre Nurseries, Hereford. A very large-flowered and sweetly scented variety. The foliage was large and the plants were about 18 inches high and of very bushy habit.

To *Iris* 'Italia' (votes, 16 for, 2 against), from Messrs. R. Wallace, Colchester. One of the late Sir Michael Foster's large-flowered hybrids, having the falls lilac-purple and the standard bluish-purple.

To *Iris* 'Isoline' (votes, 12 for), from Messrs. R. Wallace, Colchester. A large-flowered hybrid from the same raiser, having the standards and falls of pale mauve margined with bronze and the beard of bright orange. (Fig. 132.)

To *Mertensia echioides* var. *elongata* (votes, 18 for), from Messrs. Bakers, Wolverhampton. A plant 9 inches to 1 foot in height, having a bushy habit and hairy leaves. Flowers abundant, of light marine-blue and about $\frac{1}{2}$ inch across. (Fig. 133.)

To *Pelargonium* 'White Queen' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A free-flowering, pure white Pelargonium of bushy habit.

To *Pyrethrum* 'Snow Queen' (votes unanimous), from Messrs. Kelway, Langport. A large, pure white, single variety, with yellow centre.

To *Robinia Kelseyi* (votes, 13 for, 3 against), from Messrs. Robert Veitch, Exeter. A North American shrub of compact habit, with rose-coloured flowers borne on short racemes. (Fig. 134.)

To Sweet Pea 'Marjorie Hemus' (votes, 9 for, 3 against), from Miss Hemus, Upton-on-Severn. A large waved heliotrope Sweet Pea.

To Sweet Pea 'Paradise Cerise' (votes, 9 for, 4 against), from Miss Hemus, Upton-on-Severn. A large cerise flower.

FIG. 132.—IRIS 'ISOLINE.' (*Gardeners' Magazine.*) (p. cxxxiii.)

To Sweet Pea 'Prince of Orange' (votes, 11 for, 2 against), from Mr. Stevenson, Woburn Place Gardens, Addlestone. The flowers are large and waved and of a shade of cerise

To *Ranunculus* 'Evening Star' (votes, 15 for, 2 against), from Messrs. G. & A. Clark, Dover. Flowers double, very regular, 1½ to 2 inches in diameter, deep sulphur-yellow in colour.

Other Exhibits.

J. Arkwright, Esq., Lyonshall: *Cheiranthus* hybrid.
Messrs. Bakers, Codsall: hardy plants.
Messrs. Barr, Covent Garden: hardy plants.

FIG. 133.—MERTENSIA ECHIOIDES VAR. ELONGATA. (p. CXXXIII.)

H. Bartleet, Esq., Shooter's Hill: Poppies.
Herr Ernst Benary, Germany: *Lobelia hybrida* 'Miranda.'
Messrs. Bide, Farnham: Sweet Peas.
Mr. T. Burcombe, N. Devon: orange Meconopsis.
Messrs. Cheal, Crawley: shrubs.
Geo. Churcher, Esq., Alverstoke: Pæonies.
Mr. Clarence Elliott, Stevenage: alpines.
Mr. Godfrey, Exmouth: Poppies, &c.
Guildford Hardy Plant Nursery: hardy plants.
Messrs. R. Harkness, Hitchin: Lupins.

FIG. 134.—ROBINIA KELSEYI. (*Gardeners' Chronicle.*)
(p. cxxxiii.)

Mr. A. J. Harwood, Colchester: hardy plants.
Mr. T. Kitley, Bath: Pelargoniums
Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., Dorking: *Amorphophallus Schweinfurthii*, and seedling Phyllocactus.
Mr. G. W. Miller, Wisbech: Pyrethrums.
Mrs. T. Galton Moilliet, Leamington: *Papaver orientale* 'Coresande.'
Mr. W. R. Newport, Uxbridge: Geraniums.
Messrs. Carter Page, London Wall: Cactus Dahlias, &c.
Messrs. Reamsbottom, Geashill: Anemones.
Miss Troyte-Bullock, Yeovil: Pelargoniums.
Noël Turner, Esq., J.P., Welshpool: seedling Pansy.

FLORAL COMMITTEE, JUNE 21, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Bath, Wisbech, for hardy plants.
To Messrs. Prior, Colchester, for Roses.
To Messrs. L. R. Russell, Richmond, for stove plants.

Silver-gilt Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. Amos Perry, Enfield, for hardy plants.

Silver Flora Medal.

To Mr. C. Blick, Hayes, for Carnations.
To Messrs. G. Paul, Cheshunt, for Pæonies.
To G. Ferguson, Esq., Weybridge, for Delphiniums.
To Messrs. J. Veitch, Chelsea, for hardy plants, &c.

Silver Banksian Medal.

To Mr. J. Box, Lindfield, for hardy plants.
To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To A. C. Hammersley, Esq., Bourne End, for Carnations.
To Messrs. Stuart Low, Enfield, for Carnations.
To Messrs. May, Edmonton, for ferns.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Mr. Reuthe, Keston, for hardy plants.

Bronze Flora Medal.

To Messrs. Cutbush, Highgate, for hardy plants.
To Messrs. Kelway, Langport, for hardy plants.
To Mr. R. C. Notcutt, Woodbridge, for hardy plants.
To Messrs. Stark, Great Ryburgh, for Sweet Peas.

FIG. 135.—DELPHINIUM 'PURPLE VELVET.' (*Gardeners' Magazine*)
(p. cxxxix.)

To Messrs. Ware, Feltham, for Delphiniums, &c.
To Lord Hillingdon, Uxbridge, for Carnations.

Bronze Banksian Medal.

To Miss Hopkins, Shepperton, for hardy plants.

FIG. 136.—IRIS ALBOPURPUREA COLCHESTERENSIS. (*Garden.*) (p. cxl.)

Award of Merit.

To Delphinium 'Purple Velvet' (votes, 11 for, 4 against), from Messrs. Kelway, Langport. Spikes 2 feet 6 inches high, flowers large, violet-purple, with traces of blue with ivory-black centre. (Fig. 135.)

To Delphinium 'Theodora' (votes, unanimous), from G. Ferguson, Esq., Weybridge. Flowers of medium size, creamy-white, semi-double.

To *Iris albopurpurea* var. *Colchesterensis* (votes, unanimous), from Messrs. R. Wallace, Colchester. A very pretty Iris, having the falls deep purple and white, and the standards pale mauve. This form has

FIG. 137.—IRIS FULVALA. (*Garden.*)

apparently been introduced from Japan and lost sight of until now. (Fig. 136.)

To *Iris* × *fulvala* (votes, unanimous), from W. R. Dykes, Esq., Charterhouse, Goldalming. A cross between *Iris fulva* and *I. hexagona Lamancei*, resembling the former in growth, but more floriferous. The hybrid shows the influence of *I. hexagona Lamancei*, the pollen parent both in the shape of the flowers and in the presence of the pubescence

along the central ridge. The flowers are of medium size, falls deep purple with a yellow ridge, standards of pale greenish-violet. Both the parents were exhibited for comparison. (Fig. 137.)

To *Kalanchoë* × *kewensis* ' Excelsior ' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A cross between *K. flammea* and *K. Bentii*. Plant about 2 feet 6 inches high, flowers 1 inch across, Tyrian rose, borne in great profusion.

Fig. 138.—Rose ' Freda.' (*Gardeners' Magazine.*)

To Rose ' Freda ' (votes, unanimous), from Mr. G. Paul, Cheshunt. A new seedling H. T., of medium size and good form, old rose colour, not greatly scented. (Fig. 138.)

To Sweet Pea ' Dobbie's Sunproof Crimson ' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A large flower of a rich crimson red colour, said not to scorch in the hottest sunshine.

Fig. 130.—Sweet Pea 'Ivanhoe.' (p. cxliii.)

To Sweet Pea 'Ivanhoe (votes, 9 for, 2 against), from Messrs. Dobbie, Edinburgh. A medium-sized flower of a pale light lilac colour, slightly deeper at the edges. (Fig. 139.)

Other Exhibits.

Messrs. Bakers, Codsall: Aquilegias.
Messrs. Barr, King Street, Covent Garden: Irises, &c.
F. Bouskell, Esq., Nuneaton: Verbascums.
Messrs. Bull, Chelsea: Irises.
Messrs. Cannell, Swanley: Lobelias.
Messrs. Clark, Dover: hardy plants.
Messrs. Dobbie, Edinburgh: Violas.
Guildford Hardy Plant Nursery: hardy plants.
Messrs. Gill, Falmouth: *Primula imperialis*.
Mr. Harwood, Colchester: hardy plants.
Messrs. Jackman, Woking: hardy plants.
Mr. Miller, Wisbech: Pyrethrums.
Messrs. Peed, Norwood: Gloxinias, &c.
Mr. Pulham, Elsenham: hardy plants.
Sir Albert Rollit, Chertsey: Lilies.
Mr. C. Turner, Slough: Carnations.
Messrs. R. Wallace, Colchester: hardy plants.
Major Bethune, Seaton: Pink 'Mrs. P. Wills.'
Mrs. H. W. Bliss, Walton: *Delphinium* 'Queen of Delphiniums.'
W. B. Cranfield, Esq., Enfield: Pæonies.
F. French, Esq., Uckfield: Pelargoniums.
E. D. Harvey, Esq., Horsham: *Fuchsia* 'Red Lion.'
Messrs. E. W. King, Coggeshall: Sweet Pea 'Anglian Pink.'
Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., Dorking: *Cyrtanthus O'Brieni*, *Pelargonium* 'Sir Trevor Lawrence.'
Leopold de Rothschild, Esq., C.V.O., Acton: *Pelargonium* 'Little Pet.'
Admiral Sir G. S. Nares, K.C.B., F.R.S., Surbiton: Violas.
Mrs. Scott-Elliott, Hawick: Aquilegias.

FLORAL COMMITTEE, JULY 5, 1910, AT HOLLAND PARK.

Mr. WM. MARSHALL, V.M.H., in the Chair, nineteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. cvii.]

Awards Recommended:—

First-class Certificate.

To Rose (Hybrid Briar) 'Juliet' (votes, unanimous), from Messrs. W. Paul, Waltham Cross. The result of crossing 'Capt. Hayward' with 'Soleil d'Or.' Flowers of excellent form, very full, with a sweet

FIG. 140.—DELPHINIUM 'BELLADONNA SEMIPLENA.' (*Gardeners' Magazine.*)
(p. cxlv.)

scent; petals bright rosy-scarlet, with cream-yellow reverse, shading deeper towards the centre. (Figured R.H.S. Journal, vol. xxxv. p. cli.)

Award of Merit.

To *Begonia* ' Mrs. W. L. Ainslie ' (votes, unanimous), from Messrs. Blackmore & Langdon, Bath. Flowers nearly 6 inches across, double, aureoline yellow. An ideal decorative Begonia of the tuberous-rooted section.

To *Delphinium* ' Belladonna semiplena ' (votes, 14 for, 3 against), from Mr. Amos Perry, Enfield. A dwarf bedding Delphinium growing about 2½ feet high. Flowers semi-double, petals of a cornflower-blue colour tipped with lilac. (Fig. 140.)

To *Delphinium* ' Belladonna Lamartin ' (votes, 11 for, 4 against), from Mr. Amos Perry, Enfield. Another of the same section as the above, growing a little taller, and a continuous bloomer. Colour deep marine-blue.

To *Gladiolus* ' King Edward VII.' (votes, unanimous), from Mr. Frank Lilley, Guernsey. An early-flowering cross between ' Crimson Queen ' and ' Ardens.' Flowers scarlet, petals marked with white and light strawberry-red. (Fig. 141.)

To Rose ' Mrs. Foley-Hobbs ' (votes, unanimous), from Messrs. Alex. Dickson, Newtownards. A beautiful Tea-rose, of a delicate ivory-white colour; of good form and strongly scented.

To Rose ' Mary Countess of Ilchester ' (votes, unanimous), from Messrs. Alex. Dickson, Newtownards. A large-flowered Hybrid Tea with a prominent centre; of excellent form. Colour, crimson-carmine.

Other Exhibits.

Messrs. Bastock, Birmingham: Violas.
Messrs. Bath, Wisbech: *Delphinium* ' Conqueror.'
Messrs. Bide, Farnham: Sweet Pea ' Mrs. S. S. Champion.'
Messrs. B. R. Cant, Colchester: Roses.
Messrs. Clibrans, Altrincham: Delphiniums, &c.
Herr Cossebande, Saxony: Rose ' Erna.'
Messrs. Dobbie, Edinburgh: Sweet Pea and Mignonette.
Mr. Godfrey: Campanulas.
Messrs. Hobbies, Dereham: *Lathyrus latifolius* ' Pink Pearl ' and *Andromeda japonica variegata.*
Messrs. Jarmon, Chard: *Pelargonium* ' Mrs. Newton.'
Messrs. Kelway, Langport: Sweet Peas and Delphiniums.
Mr. J. Langlois, Guernsey: Gladiolus ' Minoru.'
M. Le Cornu, Jersey: Rose ' Mrs. Philip Le Cornu.'
H. Richardson, Esq., Cambs.: *Solidago* ' Early King.'
Mr. Taylor, Maidenhead: *Pelargonium* ' King George V.'
Messrs. Wallace, Colchester: Japanese Irises.
Messrs. Walshaw, Scarborough: Gladiolus ' Pink Pearl.'
Messrs. Walters, Bath: Delphiniums, &c.
Messrs. Ware, Feltham: Begonias.

FIG. 141.—GLADIOLUS 'KING EDWARD VII.' (*Gardeners' Chronicle.*)
(p. cxlv.)

Floral Committee, July 19, 1916.

Mr. Wm. Marshall, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.
To Sir Daniel Gooch, Bart., Chelmsford, for Malmaison Carnations.
To Messrs. May, Edmonton, for Crotons and ferns.

Silver-gilt Banksian Medal.

To Mr. A. Perry, Enfield, for Spiræas and Water Lilies.
To Messrs. Wallace, Colchester, for hardy herbaceous plants.
To E. J. Preston, Esq., Beckenham, for specimen plants.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Begonias.
To. Messrs. B. R. Cant, Colchester, for Roses.
To Mr. J. Douglas, Bookham, for Carnations.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Bunyard, Maidstone, for hardy plants.
To Messrs. Carter Page, London Wall, for Violas.
To Messrs. Cutbush, Highgate, for hardy plants.
To Messrs. Gunn, Birmingham, for Phloxes.
To Mr. F. Lilley, Guernsey, for Gladioli.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Ware, Feltham, for hardy plants.
To Mr. A. F. Dutton, Iver, for Carnations.

Bronze Flora Medal.

To Messrs. Russell, Richmond, for hardy Fuchsias.

Award of Merit.

To *Astilbe* × *Arendsii* ' Salmon Queen ' (votes, 11 for, 2 against), from Herr Georg Arends, Ronsdorf, Germany. A cross between *Astilbe Davidii* and *A.* ' Queen Alexandra,' of a salmon-pink colour. The plants were from 3 to 4 feet in height, and very vigorous in habit.

To *Astilbe* × *Arendsii* ' Venus ' (votes, 12 for, 1 against), from Herr Georg Arends, Ronsdorf, Germany. A cross between *Astilbe floribunda* and *A. Davidii*, of a deep violet-rose colour, and similar in habit to the above.

To *Calendula*, Dobbie's strain (votes, unanimous), from Messrs. Dobbie, Edinburgh. The strain includes two named varieties, ' Sulphur Queen ' and ' Orange King '; the former is pale yellow and the latter

is deep orange in colour, and both have splendid double flowers measuring nearly 4 inches across.

To Carnation 'Mrs. Robert Berkeley' (votes, unanimous), from Mr. J. Douglas, V.M.H., Great Bookham. A useful pink border variety, with smooth petals and a good calyx.

FIG. 142.—COSMOS 'ROSE QUEEN.' (*Gardeners' Magazine.*)

To *Cosmos* 'Rose Queen' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A charming flower, 4 inches across, mauve with yellow centre. The plants were flowering out of doors and were sown in a

cool greenhouse in March, and subsequently treated like Asters or Stocks. (Fig. 142.)

To *Fuchsia* 'Sylvia' (votes, unanimous), from Messrs. Veitch, Chelsea. A fine variety, having large double flowers with an inflated white calyx and bright red petals.

To *Gypsophila carminea* (votes, unanimous), from Messrs. Dobbie, Edinburgh. A very useful annual, having pale carmine flowers ½ inch across, borne in great profusion on much-branched, slightly sticky stems.

To *Rosa multiflora* 'Flame' (votes, unanimous), from Mr. C. Turner, Slough. A very showy, semi-double variety of a rosy-crimson colour with whitish centre. The flowers are borne on large trusses, and the plant is said to grow 9 feet high.

To *Senecio glastifolius* var. (votes, 12 for, 6 against), from Hon. Vicary Gibbs, Elstree. Flowers of a bright purplish-mauve colour.

To Sweet Pea 'Earl Spencer' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A large-flowered variety, with a waved standard; colour, a very pleasing shade of bright orange.

To Sweet Pea 'Elfrida-Pearson' (votes, unanimous), from Messrs. Pearson, Lowdham. A large Sweet Pea of a beautiful lilac-rose colour, borne four on a spike, and frequently having a double standard.

To Sweet Pea 'Iris' (votes, unanimous), from Mr. Breadmore, Winchester. A large salmon-carmine flower, with a good, waved, standard.

To Sweet Pea 'Marion Cuthbertson' (votes, unanimous), from Messrs. Dobbie, Edinburgh. Colour, a beautiful pale lilac-rose. (Fig. 143.)

To Sweet Pea 'Mrs. F. A. Wellesley' (votes, unanimous), from F. A. Wellesley, Esq., Woking. A magnificent pure white Pea, borne in fours, on very stout stems.

Other Exhibits.

Herr G. Arends, Ronsdorf: Astilbes.
Messrs. Barr, Covent Garden: hardy plants.
Herr E. Benary, Erfurt: vars. of *Impatiens Holstii nana*.
Mrs. R. Berkeley, Worcester: *Cynoglossum furcatum*.
H. D. Broughton, Esq., Andover: Roses.
Mr. H. Dixon, Wandsworth Common: Gladioli.
Mr. C. Elliott, Stevenage: alpines.
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Mr. A. Harwood, Colchester: hardy plants.
Misses Hopkins, Shepperton: hardy plants.
Mr. P. Kolameth, Betchley: Lobelias.
Messrs. Low, Bush Hill Park: Roses.
Mr. G. Miller, Wisbech: *Delphinium* 'Julian.'
D. Rowland, Esq., Monmouth: Carnation 'Fred Taylor.'
Messrs. Stark, Great Ryburgh: Tritomas.
Messrs. Wells, Merstham: Phlox and Violas.

Fig. 143.—Sweet Pea 'Marion Cuthbertson.' (p. cxlix.)

FLORAL COMMITTEE, AUGUST 2, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Mr. C. Blick, Hayes, for Carnations.

FIG. 144.—CARNATION 'FORESTER.' (*Gardeners' Chronicle.*) (p. clii.)

Silver Flora Medal.

To Messrs. Kelway, Langport, for Gladioli and Delphiniums.

To Messrs. May, Upper Edmonton, for Campanulas, &c.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for annuals.
To Messrs. Paul, Cheshunt, for Phloxes and Marguerites.

Bronze Flora Medal.

To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Wells, Merstham, for Phloxes.

Bronze Banksian Medal.

To the Guildford Hardy Plant Nursery, Guildford, for hardy plants.

Award of Merit.

To Carnation 'Mrs. J. A. Reynolds' (votes, 6 for, 1 against), from Mr. J. Douglas, Great Bookham. A border variety, with large flowers of good form. The petals are pale buff, shading to reddish-apricot at the edges.

To Carnation 'Forester' (votes, 9 for, 1 against), from Mr. J. Douglas, Great Bookham. Another border variety, with sulphur-yellow petals streaked with dull crimson. The flowers are very large and of excellent form. (Fig. 144.)

To Phlox 'Frau Antonin Buckner' (votes, 7 for, 2 against), from Messrs. Wells, Merstham. A beautiful pure white Phlox, having flowers $1\frac{3}{4}$ inch across. The eye is slightly tinged with very pale green. The plant is said to grow about 3 feet in height.

Other Exhibits.

Mr. W. Easlea, Eastwood: Carnations.
H. Foster, Esq., Eltham: Viola 'Hudson Foster.'
Mr. A. Foxall, Loughborough: Rose 'Jennie Foxall.'
Messrs. Harkness, Bedale: hardy plants.
Mr. F. Lilley, Guernsey: Sparaxis and Gladioli.
G. Savage, Esq., W.: *Trifolium stellatum.*
Messrs. Veitch, Chelsea: annuals.

FLORAL COMMITTEE, AUGUST 16, 1910.

Mr. WILLIAM MARSHALL, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Sidney Morris, Esq., Thetford, for Montbretias.

Silver-gilt Banksian Medal.

To Mr. C. W. Breadmore, Winchester, for Sweet Peas.
To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. Pfitzer, Stuttgart, Germany. for Gladioli.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Paul & Son, Cheshunt, for Phloxes.

Silver Banksian Medal.

To Messrs. G. Bunyard, Maidstone, for hardy flowers.
To Messrs. Carter Page, London Wall, for Dahlias.
To Col. G. H. Trollope, Cobham, for *Campanula pyramidalis*.
To Messrs. J. Veitch, Chelsea, for miscellaneous flowering plants.

Bronze Flora Medal.

To Mr. J. Box, Lindfield, for Phloxes, &c.
To Messrs. May, Upper Edmonton, for Ferns.
To Messrs. Ware, Feltham, for hardy plants.

Bronze Banksian Medal.

To Mr. F. Brazier, Caterham, for Phloxes.
To Sir Daniel Gooch, Bart., Chelmsford, for Carnations and Chrysanthemums.

Award of Merit.

To *Gladiolus* 'Europa' (votes, unanimous), from Mr. Pfitzer, Stuttgart, Germany. A beautiful pure white variety, having flowers of medium size with a tinge of lilac-crimson at the base of the petals.

To *Gladiolus* 'Gräfin Degenfeld' (votes, unanimous), from Mr. Pfitzer, Stuttgart, Germany. A variety having medium-sized flowers of creamy-white tinged with pink, and the lower petals blotched with bright scarlet. (Fig. 145.)

To *Gladiolus* 'Karl Luz' (votes, 10 for, 5 against), from Mr. Pfitzer, Stuttgart, Germany. A beautiful bright crimson Gladiolus, having the lower petals streaked with a darker shade in the middle.

To *Gladiolus primulinus* (votes, unanimous), from Messrs. Kelway, Langport. A beautiful primrose-yellow species, having four or five flowers in a lax spike. It was introduced in 1889 from South-East Tropical Africa.

Other Exhibits.

Messrs. Barr, Covent Garden: hardy plants.
Messrs. Bide, Farnham: Sweet Peas.
Messrs. Clark, Dover: hardy plants.
Guildford Hardy Plant Nursery: hardy plants.
Mr. A. Ll. Gwillim, New Eltham: Begonias.
Mr. A. J. Harwood, Colchester: hardy plants.
Sir Trevor Lawrence, Bart., Dorking: *Chrysanthemum inodorum* 'Bridal Robe,' *Heliopsis scabra gratissima*.
Messrs. Rich, Bath: Phloxes.

FIG. 145.—GLADIOLUS 'GRÄFIN DEGENFELD.' (*Gardeners' Chronicle.*)
(p. cliii.)

Leopold de Rothschild, Esq., Acton: Nymphaeas.
The Earl of Warwick, Dunmow: Nymphaeas.
Messrs. Watson, Dublin: Carnations.
Messrs. Wells, Merstham: hardy plants.
Messrs. Whitelegg & Page, Chislehurst: hardy plants.
Mr. F. Woollard, Brighton: Roses.

Floral Sub-Committee at Wisley, August 23, 1910.

Mr. W. Marshall, V.M.H., in the Chair, and three members present.

The following Gladioli selected from the trials were highly commended:—

G. 'Dora Krais,' G. 'Europa,' G. Fernando Cortez,' G. 'Gargantua,' G. 'La Luna,' G. 'Le Triomphe,' and G. 'Safrano.'

Clarkia 'Brilliant,' from Messrs. J. Veitch, Chelsea, was also highly commended.

Floral Committee, August 30, 1910.

Mr. W. Marshall, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Gold Medal.

To Hon. Vicary Gibbs, Elstree, for a collection of shrubs raised from seeds sent home by Mr. E. H. Wilson from Western China.

Silver-gilt Flora Medal.

To Messrs. Bakers, Wolverhampton, for Dahlias and Asters.
To Messrs. Carter Page, London Wall, for Dahlias.
To Messrs. L. R. Russell, Richmond, for hardy Ericas, &c.

Silver-gilt Banksian Medal.

To Messrs. Gunn, Birmingham, for Phloxes.
To Messrs. May, Upper Edmonton, for Ferns.

Silver Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.
To Mr. F. Brazier, Caterham, for Phlox and Pentstemons.
To Messrs. Cannell, Swanley, for Dahlias.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for Dahlias.
To Messrs. J. Veitch, Chelsea, for greenhouse plants.
To Mr. Amos Perry, Enfield, for Delphiniums.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants.

Bronze Flora Medal.

To Messrs. W. & J. Brown, Peterborough, for Roses.
To Messrs. Paul, Cheshunt, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for Dahlias.
To Messrs. T. S. Ware, Feltham, for hardy plants.
To Messrs. Wells, Merstham, for Chrysanthemums and Phloxes.

Award of Merit.

To *Buddleia variabilis* var. *gigantea* (votes, 8 for, 3 against), from Hon. Vicary Gibbs, Elstree. A beautiful decorative shrub, having much larger flower spikes than any other known variety of *B. variabilis*.

To *Dahlia* 'Crystal' (votes, 12 for, 1 against), from Messrs. J. Stredwick, St. Leonards-on-Sea. A rosy pink 'Cactus' variety, having flowers of medium size.

To *Dahlia* 'Garden Yellow' (votes, 8 for, 1 against), from Mr. H. Shoesmith, Woking. A large, very bright, sulphur-yellow 'Cactus' variety, having very stout, stiff stems.

To *Dahlia* 'Guinevere' (votes, 12 for), from Mr. C. Turner, Slough. A 'Pompon' variety, about 2 inches in diameter. Colour, rose shading to buff at the base of the petals.

To *Dahlia* 'Leander' (votes, 11 for), from Messrs. J. Cheal, Crawley. A single variety about 3 inches in diameter, having petals of a rich velvety maroon edged with crimson scarlet.

To *Dahlia* 'Mrs. Douglas Fleming' (votes, 10 for), from Messrs. J. Stredwick, St. Leonards. A good 'Cactus' variety, having the petals white tinged with yellowish-green at the base.

To *Dahlia* 'Theresa' (votes, 5 for, 2 against), from Mr. C. Turner, Slough. A 'Cactus' variety, with white petals tinged with lilac at the tips and with greenish-yellow at the base.

To *Gladiolus* 'Safrano' (votes, 11 for), from Messrs. Vilmorin, Paris. A primrose-yellow variety, having crimson blotches on the lower petals.

To *Gladiolus* 'La Luna' (votes, 10 for, 1 against), from Messrs. Barr, Covent Garden. The flowers are cream coloured, flushed with rose, and marked with crimson.

To *Lobelia* 'Sam Barlow' (votes, unanimous), from Messrs. Barr, Covent Garden. A variety of the *L. cardinalis* section, having rose-salmon flowers.

To *Phlox* 'Elizabeth Campbell' (votes, 9 for), from Messrs. W. Wells, Merstham. A pink variety, with white centre. The flowers are over 1½ inch in diameter, and the plant is said to grow about 2 feet tall.

To Rose 'Daphne' (votes, 9 for, 3 against), from Rev. J. H. Pemberton, Havering-atte-Bower. A perpetual flowering hybrid *moschata* rose, having flowers of a delicate pink shade when first opening, but later fading to white. The flowers are very sweetly scented, and are said to grow in great abundance on a dwarf bush about 4 feet tall. It is also claimed that this rose is unaffected by wet or mildew.

Other Exhibits.

Messrs. Bolton, Buntingford: hardy plants.

Mr. H. Dixon, Wandsworth: Gladioli.

Messrs. Dobbie, Edinburgh: Stock 'Abundance' and *Cosmos* 'Crimson King.'

Messrs. Dowson, Middlesborough: Carnation 'The Dowson.'

Guildford Hardy Plant Nursery: hardy plants.

W. R. Hammond, Esq., Burgess Hill: Sweet Pea 'Phyllis Hammond.'

The Harrow Nursery Co., Harrow: Roses.

Messrs. Ladhams, Southampton: Lobelias.

Messrs. Low, Bush Hill Park: greenhouse plants.

Mr. S. Mortimer, Farnham: Dahlias.

Messrs. Whitelegg & Page, Chislehurst: hardy plants.

ORCHID COMMITTEE.

May 3, 1910.

Mr. J. Gurney Fowler in the Chair, and twenty-two members present.

Awards Recommended:

Silver Flora Medal.

To Messrs. Charlesworth, for a group.
To Messrs. Sander, for a group.

Fig. 146.—Odontioda × Charlesworthii var. Theodora.
(p. clix.)

First-class Certificate.

To *Cattleya* × *Dusseldorfei* 'Undine,' Westonbirt variety (*intermedia alba* × *Mossiae Wageneri*) (votes, unanimous), from Lieut.-Col. Sir G. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Flowers

larger than the ordinary form; pure white with primrose-yellow disc to the lip. The plant bore eight flowers and buds.

To *Odontioda* × *Charlesworthii* var. 'Theodora' (*Cochlioda Noezliana* × *Odontoglossum Charlesworthii*) (votes, unanimous), from de B. Crawshay, Esq. (gr. Mr. Stables). The largest dark scarlet *Odontioda*. (Fig. 146.)

To *Miltonia* × *Bleuana*, Hessle variety (*M. vexillaria* 'Queen Alexandra' × *M. Roezlii*) (votes, unanimous), from W. P. Burkinshaw, Esq., Hessle, Hull (gr. Mr. Barker). Flowers large, white tinted with pink; lip broad with a reddish crimson mask at the base. (Fig. 147.)

Award of Merit.

To *Odontoglossum crispum* 'Magnum Bonum' (votes, 13 for, 5 against), from Lieut.-Col. Sir G. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). A model flower with equally broad segments; white with clusters of red-brown spots on the sepals and lip.

To *Cattleya Mendelii* 'Pearl McBean' (votes, 14 for, 2 against), from Messrs. McBean, Cooksbridge. A large blush-white flower with a broad purple band on the petals, the lip having a mauve-crimson crimped front lobe.

Botanical Certificate.

To *Disa venusta*, from Mrs. Bischoffsheim, The Warren House, Stanmore (gr. Mr. Taylor). A slender blue-flowered species of the *D. graminifolia* section.

Cultural Commendation.

Silver Lindley Medal to Mr. May, gr. to J. B. Joel, Esq., for a very fine plant of *Cypripedium Rothschildianum*.

Other Exhibits.

Lieut.-Col. Sir G. L. Holford, K.V.C.O.: *Cattleya Mendelii*.

de B. Crawshay, Esq.: hybrid Odontoglossums.

Messrs. Jas. Veitch: *Brassocattlaelia* × 'Pink Beauty' (*L.-c.* × *Hippolyta* × *B.-c.* × *Digbyano-Mossiae*).

H. S. Goodson, Esq.: a group.

Mr. Gurney Wilson: *Odontoglossum crispum* 'Empress of India.'

Mr. E. V. Low: Cattleyas.

Messrs. McBean: Odontoglossums.

Monsieur M. Merfens: hybrid Odontoglossums.

Sir Trevor Lawrence, Bart., K.C.V.O.: *Odontoglossum platycheilum splendens*.

R. G. Thwaites, Esq.: *Odontoglossum* × *Thwaitesii* (*ardentissimum* × *Harryanum*).

R. Brooman-White, Esq.: *Cypripedium* × 'Nonpareil.'

ORCHID COMMITTEE, TEMPLE SHOW, MAY 24-26, 1910.

Mr. HARRY J. VEITCH in the Chair, and twenty-two members present.

[For awards of Cups and Medals made by the Council after consultation with the Judges, see p. xcviii.]

Awards Recommended:—

First-class Certificate.

To *Odontoglossum* × 'Memoria King Edward VII.' (parentage unrecorded) (votes, unanimous), from Messrs. Sander, St. Albans.

FIG. 148.—ODONTOGLOSSUM × 'MEMORIA KING EDWARD VII.' (*Gard. Mag.*)

Flowers large, the broad segments heavily blotched with dark purple, the margins and small inner markings being white. (Fig. 148.)

To *Miltonia vexillaria* 'Memoria Baron Schröder' (votes, unanimous), from Messrs. Sander. A superb form raised from seeds of

Fig. 149.—Miltonia vexillaria 'Memoria Baron Schröder.'

intercrossed fine forms of *M. vexillaria*. Flowers large, delicate pink, changing to white towards the margins, the lip bearing a deep-crimson mask in front of the crest. (Fig. 149.)

To *Cattleya Lawrenceana* ' Mary Regina ' (votes, unanimous), from Messrs. Charlesworth, Haywards Heath. The first albino of this well-known species. Flowers pure white with a slight pink flush on the front of the lip. (Fig. 150.)

Sobralia Ruckeri Charlesworthii (votes, 12 for, 4 against), from Messrs. Charlesworth. Differing from the type in the yellow colouring of the disc of the lip. (Fig. 151.)

To *Cattleya Mendelii* ' Princess Victoria ' (votes, unanimous), from Messrs. Mansell & Hatcher, Rawdon, Yorks. Flowers white on open-

ing, a slight rose tint appearing when mature, and a narrow rose band on the crimped margin of the lip.

Award of Merit.

To *Cattleya Mossiae* 'Magali Sander' (votes, unanimous), from Messrs. Sander. Flowers white with rose front to the lip.

To *Odontoglossum* × *eximium* 'Emperor' (*crispum* × *ardentissimum*) (votes, unanimous), from Messrs. Sander. Flowers of fine shape, white heavily blotched with dark purple.

To *Cattleya Mendelii* 'Queen Maud' (votes, unanimous), from Messrs. Charlesworth. A charming white form with magenta front to the lip.

To *Laeliocattleya* × *Aphrodite* 'Mark Hambourg' (*L. purpurata* × *C. Mendelii*) (votes, unanimous), from J. Talbot Clifton, Esq., Lytham Hall, Lytham (gr. Mr. Float). Flowers pure white with finely developed crimson lip.

To *Laeliocattleya* × *luminosa magnifica* (*L. tenebrosa* × *C. Dowiana aurea*) (votes, unanimous), from his Grace the Duke of Marlborough, Blenheim (gr. Mr. Hunter). Flowers bronzy orange with claret-purple lip.

Botanical Certificate.

To *Lycaste peruviana*, from Messrs. Sander. Resembling a miniature *L. fulvescens*. Flowers white, tinged with sepia-brown. Lip fringed.

To *Bifrenaria bicornaria*, from Messrs. Sander. Of the *B. aurantiaca* section. Inflorescence with ten or twelve orange flowers spotted with purple.

Other Exhibits.

Mr. John Robson: a group.

Mr. Harry Dixon: a group.

Francis Wellesley, Esq.: fine Cattleyas.

J. Gurney Fowler, Esq.: *Odontoglossum amabile Fowlerianum.*

Mrs. Norman Cookson: *Cypripedium* × 'Mary Amelia' ('Lord Derby' × *Godefroyae leucochilum*).

ORCHID COMMITTEE, JUNE 7, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-one members present.

Awards Recommended:—

Gold Medal.

To Miss Maud Walters Anson, for a large number of finely executed paintings of rare Orchids.

Silver-gilt Flora Medal.

To Messrs. Charlesworth, for Laeliocattleyas.

Silver Flora Medal.

To Henry Little, Esq., for a group of *Laelia purpurata*.
To Mr. W. H. Smith, for a group of *Vanda teres*.
To Messrs. Sander, for a group.
To Messrs. Stuart Low, for a group.

Silver Banksian Medal.

To Messrs. McBean, for Odontoglossums.
To Mr. A. W. Jensen, for a group of *Cattleya Warscewiczii*.

First-class Certificate.

To *Odontioda* × 'St. Fuscien' var. 'Imperator' (*Odontoglossum* × *Adrianae* × *Cochlioda Noezliana*) (votes, unanimous), from Monsieur

Fig. 152.—Odontioda × 'St. Fuscien Imperator.'

Henri Graire, Amiens. A fine hybrid, equal in size to an ordinary *Odontoglossum crispum*. Flowers red, with small whitish markings on the segments. (Fig. 152.)

Award of Merit.

To *Miltonia vexillaria* ' Snowflake ' (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). A fine snow-white variety with pale yellow mask at the base of the lip. (Fig. 153.)

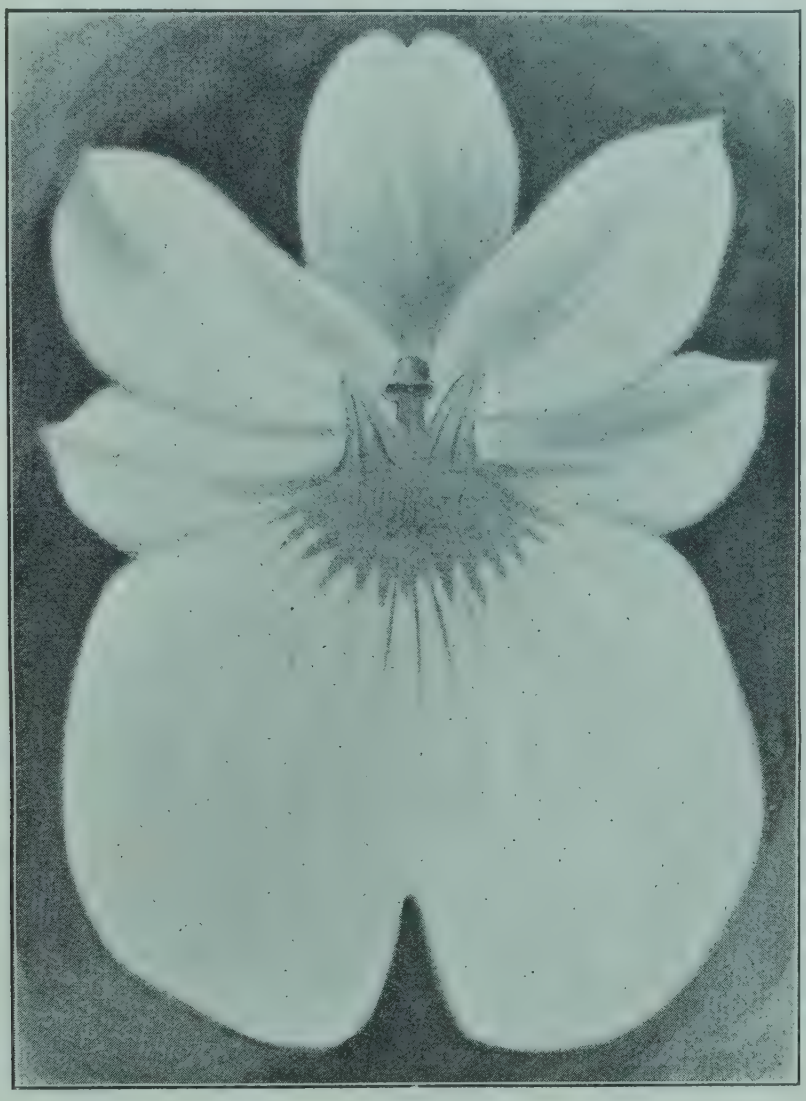


Fig. 153.—Miltonia vexillaria var. 'Snowflake.' (*Journal of Horticulture.*)

To *Odontioda* × *gattòniensis rosefieldiensis* (*O. polyxanthum* (*Kegeljanii*) × *C. Noezliana*) (votes, unanimous), from de B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Stables). Flowers scarlet, with the lemon-yellow ground colour showing in places.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid grower to Lieut.-Col. Sir George L. Holford, K.C.V.O., for two fine specimens of *Miltonia vexillaria.*

Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H.: an interesting collection of rare Orchids.

F. Menteith Ogilvie, Esq.: *Cypripedium callosum Sanderae* and *C. Lawrenceanum Hyeanum*, Bank House variety.

Mrs. Norman Cookson: *Odontoglossum crispum.*

H. S. Leon, Esq.: *Cattleya Mossiae Wageneri.*

Francis Wellesley, Esq.: hybrid Orchids.

Messrs. Jas. Veitch: *Anguloa* × *dubia superba.*

Messrs. Stanley: *Cattleya Mossiae* varieties.

Mr. E. V. Low: a group.

Monsieur Mertens: hybrid Odontoglossums.

de B. Crawshay, Esq: hybrid Odontoglossums.

ORCHID COMMITTEE, JUNE 21, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, for a group.

To Messrs. Stuart Low, for a group.

Award of Merit.

To *Odontioda* × *Vuylstekeae*, Walton Grange variety (*O. Pescatorei* × *C. Noezliana*) (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone, Stafford (gr. Mr. W. Stevens). A very fine flower, with equally broad bright scarlet segments, with some slight wavy white lines appearing on the sepals and petals.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid grower to Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt, for a very fine specimen of *Laelia tenebrosa*, Walton Grange variety, with four flowers on a spike.

To Mr. James Hudson, V.M.H., gr. to Leopold de Rothschild, Esq., Gunnersbury House, Acton, for a fine specimen of *Cattleya Warscewiczii gigantea*, with six flowers on one of the spikes.

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., Burford, for *Odontoglossum* × *Vuylstekei*, with two strong spikes each of ten flowers.

Other Exhibits.

H. S. Goodson, Esq.: rare Orchids.

W. Thompson, Esq.: Odontoglossums and Odontiodas.

Francis Wellesley, Esq.: Cattleyas.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H.: rare species.

Sir Jeremiah Colman, Bart., V.M.H.: *Odontoglossum crispum* 'The Hon. Marguerite Joicey.'

Walter Cobb, Esq.: *Dendrobium Dearei*, Cobb's var.

Messrs. McBean: Cattleyas.

Mr. H. A. Tracy: *Cattleya Mendelii* var. *coerulea*.

W. H. St. Quintin, Esq.: *Cattleya Gaskelliana*, Scampston Hall variety.

F. W. Moore, Esq., Glasnevin: *Lacaena bicolor* variety.

Monsieur Mertens: hybrid Orchids.

ORCHID COMMITTEE, HOLLAND PARK, JULY 5, 1910.

Mr. HARRY J. VEITCH, V.M.H., in the Chair, and twenty-three members present.

[For awards of Cups and Medals made by the Council after consultation with the Judges see p. cvii.]

Awards Recommended:—

First-class Certificate.

To *Miltonia vexillaria Lambeauiana* (votes, unanimous), from Messrs. Sander, St. Albans. The large pure white variety which received an A.M. July 23, 1907.

To *Cattleya Mendelii alba* 'Stuart Low' (votes, unanimous), from Messrs. Stuart Low, Bush Hill Park. Flowers large and of good shape; pure white, with chrome-yellow disc to the lip. (Fig. 154.)

Award of Merit.

To *Cattleya* × *Dietrichiana* (*superba* × *Hardyana*) (votes, unanimous), from Messrs. Sander, St. Albans. Flowers large, rosy-lilac, the broad front of the lip glowing ruby-purple; the disk light orange colour.

To *Cypripedium Curtisii*, Sander's variety (votes, unanimous), from Messrs. Sander. A well-marked form of strong growth, and bearing flowers larger in size and darker in colour than the original.

To *Cattleya Mendelii* 'King George V.' (votes, unanimous), from Messrs. Sander. A distinct form remarkable for the highly developed crimped border of the lip, which is magenta-rose in colour. Sepals and petals white, tinged with pink.

Other Exhibits.

F. Menteith Ogilvie, Esq.: *Cattleya Warscewiczii* 'Mrs. E. Ashworth,' and other Orchids.

J. Gurney Fowler, Esq.: *Cataseium thylaciochilum* and *Odontoglossum Pescatorei album*.

Messrs. Stuart Low: a group.

Messrs. Jas. Veitch: fine specimens of *Disa* × *Luna* and other Orchids.

ORCHID COMMITTEE, JULY 19, 1910.

Mr. J. GURNEY FOWLER in the Chair, and seventeen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Sander, for a group.
To Messrs. Stuart Low, for a group.

First-class Certificate.

To *Cattleya Warscewiczii*, Low's variety (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). A dark form of the *C. Warscewiczii saturata* section, in which the light patches on each side of the labellum are very small. The specimen bore fourteen flowers. (Fig. 155.)

To *Cattleya* × *O'Brieniana alba* (votes, unanimous), from Messrs. Stuart Low, Bush Hill Park. A fine pure white form of the pale rose natural hybrid. (Fig. 156.)

Award of Merit.

To *Cattleya* × 'Artemis' (× 'Iris' × *Gaskelliana*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. Sepals and petals pink; front of the lip purplish-crimson, with a narrow lavender margin; the central portion orange, fading to cream-white.

To *Oncidium Sanderae* (votes, unanimous). A distinct species of the *O. Papilio* section. Dorsal sepal and petals linear, erect, purplish, changing to sepia-brown. Broad lateral sepals decurved, yellow barred with red-brown; lip much crimped and fringed light yellow with red-brown markings inside the margin and on the side lobes. A distinguishing feature is the highly developed, beard-like glands on each side of the column, the upper side of which is nearly black.

To *Zygopetalum* (*Pescatorea*) *lamellosum* (votes, unanimous), from Messrs. Charlesworth. Flowers greenish cream-white, with a much thickened purple ridged callus on the lip.

Botanical Certificate.

To *Bulbophyllum rhizophorae*, from Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. A dwarf tufted tropical African species, with slender drooping racemes of brown and yellow flowers.

To *Liparis rhodochila*, from Sir Trevor Lawrence, Bart. Flowers on erect spikes; green with orange lip.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid grower to Lieut.-Col. Sir George L. Holford, K.C.V.O., for two fine plants of *Miltonia vexillaria* 'Queen Alexandra.'

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for *Cypripedium* × 'W. R. Lee,' Burford variety, with eleven flowers.

Other Exhibits.

Messrs. Charlesworth: a group.
Sir Jeremiah Colman, Bart., V.M.H.: rare species.

FIG. 156.—CATTLEYA O'BRIENIANA ALBA. (*Stuart Low.*) (p. clxviii.)

Francis Wellesley, Esq.: white *Cattleya Gaskelliana.*
A. Harrison, Esq.: Cypripediums.
H. S. Goodson, Esq.: *Cattleya Rex.*
R. G. Thwaites, Esq.: *Odontioda* × *Thwaitesii.*
de B. Crawshay, Esq.: *Odontioda* × 'Seuenacca' (*C. Noezliana* × *O. Hunnewelliana*).
Messrs. McBean: *Odontoglossum* × *ardentissimum* 'Doris.'

ORCHID COMMITTEE, AUGUST 2, 1910.

Mr. HARRY J. VEITCH in the Chair, and ten members present.

Awards Recommended:

Award of Merit.

To *Cattleya Warscewiczii* 'Othello' (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flowers large, sepals and petals rosy lilac; lip mauve-purple with a small yellow spot on each side of the tube, and gold veining from the base.

Botanical Certificate

Dendrobrium Bullenianum, from Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. Flowers produced in short racemes from the mature pseudo-bulbs; apricot-yellow with purple lines.

Cultural Commendation.

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., for *Oncidium incurvum*, with twenty-seven spikes.

Other Exhibits.

de B. Crawshay, Esq.: hybrid Odontoglossums.

J. S. Moss, Esq.: *Odontoglossum* × 'Maritana' (*sceptrum* × *Rolfeae*).

H. S. Goodson, Esq.: *Odontoglossum crispum Herbertii* and an Odontioda.

William Thompson, Esq.: *Masdevallia coccinea*, with yellowish-white flowers.

Mr. H. A. Tracy: *Catasetum* sp.

Mr. E. V. Low: a small group.

Monsieur Mertens: Odontoglossums.

Messrs. McBean: *Cattleya* 'Germania,' with a spike of seven flowers.

ORCHID COMMITTEE, AUGUST 16, 1910.

Mr. HARRY J. VEITCH in the Chair, and sixteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander), for very fine varieties of *Vanda coerulea*, with thirty *Cypripedium* × *Maudiae*.

Silver-gilt Lindley Medal.

To Mrs. Bischoffsheim, The Warren House, Stanmore (Orchid grower, Mr. Taylor), for a group of about 100 finely bloomed plants of *Disa grandiflora*.

Silver Flora Medal.

To Messrs. Sander, for a group.
To Messrs. Stuart Low, for a group

First-class Certificate.

To *Vanda coerulea*, Westonbirt variety (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. Alexander). A grand variety with flowers five inches across, veined with indigo blue; lip dark violet.

Award of Merit.

To *Oncidium Mantinii Lowii* (votes, unanimous), from Mr. E. V. Low, Vale Bridge, Haywards Heath. Flowers bright yellow with obscure olive-brown blotches.

Botanical Certificate.

To *Bulbophyllum exaltatum*, from Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. (gr. Mr. W. H. White). Scapes slender, bearing on the outer halves small flowers with purple-fringed lip.

To *Polystachya paniculata*, Rolfe, from Sir Trevor Lawrence, Bart. A new species from Uganda, with curiously flattened pseudo-bulbs and broad dark-green leaves spotted with purple. The erect, branched inflorescence bore numerous small orange-red flowers.

To *Theodorea gomezoides*, from Sir Trevor Lawrence, Bart. A dwarf Brazilian species with slender drooping racemes of greenish flowers.

To *Cyrtopodium Andersonii*, from Messrs. Stuart Low. A fine old species with stout erect spikes of showy yellow flowers.

To *Stanhopea saccata*, from Messrs. Stuart Low. Sepals and petals yellowish spotted with purple, the base of the labellum having a deep orange-coloured pouch.

Cultural Commendation.

To Mr. Bristow, gr. to Mrs. Temple, Groombridge, for *Cypripedium* × *Wiertzianum*, with three fine spikes.

Other Exhibits.

Messrs. Charlesworth: a group.
H. S. Goodson, Esq.: Odontoglossums and Cattleyas.
Sir Trevor Lawrence, Bart., K.C.V.O.: rare species.
de B. Crawshay, Esq.: hybrid Odontoglossums.
Mrs. Norman C. Cookson: hybrid Orchids.
Mr. E. V. Low: a group.
Messrs. McBean: a group.
Messrs. Jones & Howes, Kenilworth: *Cattleya O'Brieniana alba*

ORCHID COMMITTEE, AUGUST 30, 1910.

Mr. J. GURNEY FOWLER in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. G. E. Day), for a group.

To Messrs. Charlesworth, Haywards Heath, for rare hybrids.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Stuart Low, Bush Hill Park, for a group.

Silver Banksian Medal.

To Mr. E. V. Low, Vale Bridge, Haywards Heath, for *Cattleya* × 'Adula,' and other Orchids.

First-class Certificate.

To *Cattleya* × 'Rhoda,' Fairlawn variety (*Iris* × *Hardyana*) (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). Sepals and petals reddish-purple. Lip broad, claret-crimson, with gold lines from the base. Column white. (Fig. 157.)

Award of Merit.

To *Laeliocattleya* × 'Golden Oriole' var. *tigrina* (*L.-c. Charlesworthii* × *C. Dowiana*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Sepals and petals dark Indian red, with fine chrome-yellow veining. Lip ruby-crimson, with gold lines from the base. The spike bore six flowers.

To *Cattleya* × *Hardyana*, Holford's variety (*Dowiana aurea* × *Warscewiczii*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. Flower large and of fine colour. Sepals and petals rosy-lilac. Lip dark reddish-claret, with light-yellow blotches in the centre, and gold veining.

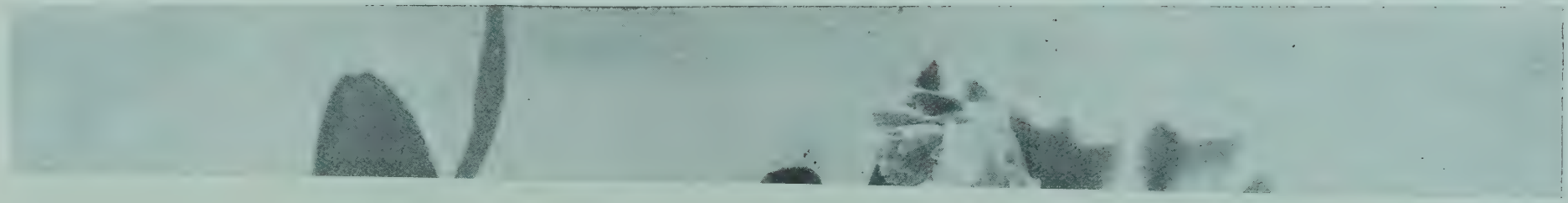
To *Cattleya* × 'Adula,' Vale Bridge variety (*bicolor* × *Hardyana*) (votes, unanimous), from Mr. E. V. Low, Vale Bridge, Haywards Heath. Sepals and petals pale rose-pink. Lip broad, magenta-rose.

Botanical Certificate.

To *Dendrobium karoense*, from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). A singular little species from New Guinea. Similar in growth to some species of *Pleurothallis*, and producing singly its small white flowers in a similar manner.

Cultural Commendation.

To Mr. W. H. White, Orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for a very large specimen of *Platyclinis filiformis*.



Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H.: rare Orchids.

de B. Crawshay, Esq.: hybrid Odontoglossums.

J. Gurney Fowler, Esq.: *Cattleya* × '*Rhoda*,' Fowler's variety.

Francis Wellesley, Esq.: Laeliocattleyas.

Messrs. Jas. Veitch: *Cattleya Hardyana*, with dissimilar flowers on the same spike.

Messrs. McBean: *Odontoglossum ardentissimum album.*

Messrs. Mansell & Hatcher: *Eria bractescens.*

Trustees of the late E. Rogerson: Miltonias.

NARCISSUS AND TULIP COMMITTEE.

March 8, 1910.

Mr. H. B. May in the Chair, and sixteen members present.

No new Daffodils were shown.

The Hon. Secretary reported that the Council had approved the new Daffodil classification, and that the consensus of opinion among leading Daffodil societies was also in its favour. Mr. P. R. Barr had promised to classify the varieties already in the Daffodil list ready for the consideration of the Sub-Committee.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Cartwright and Goodwin, Kidderminster, for a group of Daffodils.

To Messrs. R. and G. Cuthbert, Southgate, N., for a large group of Tulips in pots.

Silver Flora Medal.

To Messrs. Barr, Covent Garden, for a group of Daffodils.

Silver Banksian Medal.

To Messrs. Robt. Sydenham, Birmingham, for Daffodils.

To Messrs. R. H. Bath, Wisbech, for Daffodils and Tulips, grown in moss fibre in fancy receptacles.

Other Exhibits.

Messrs. Pearson, Lowdham, Notts: group of Daffodils.

Messrs. Carter Page, London Wall: bulbs grown in moss fibre.

Narcissus and Tulip Committee, March 22, 1910.

Mr. H. B. May in the Chair, and sixteen members present.

Two new Daffodils were shown, but no awards were made.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Cartwright and Goodwin, Kidderminster, for a group of Daffodils.

Silver Flora Medal.

To Messrs. Sutton, Reading, for a group of Tulips.

To Mr. Alex. M. Wilson, Shovel, Bridgwater, for new Daffodils.

Fig. 158.—Narcissus 'Mrs. Norman Cookson.' (*Gardeners' Chronicle.*)
(p. clxxvi.)

(*To face page* clxxiv.)

FIG. 159.—NARCISSUS 'COLLEEN.' (*Gardeners' Chronicle.*)
(p. clxxvi.)

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Other Exhibits.

Messrs. Bath, Wisbech: Daffodils and Tulips.
Messrs. Robt. Sydenham, Birmingham: Daffodils

NARCISSUS AND TULIP COMMITTEE, APRIL 5, 1910.

Mr. H. B. MAY in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Medal.

To Mr. Alex. M. Wilson, Shovel, Bridgwater, for new Daffodils.

Silver Flora Medal.

To Messrs. Cartwright and Goodwin, Kidderminster, for Daffodils.
To Mr. J. A. Cooper, Lissadell Bulb Farm, Sligo, for Daffodils.
To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver Banksian Medal.

To Messrs. J. Carter, High Holborn, for a group of 'King Alfred' Daffodils.

Bronze Banksian Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.
To Mr. Frank Lilley, Guernsey, for Daffodils.

NARCISSUS AND TULIP COMMITTEE, APRIL 19, 1910.

Mr. H. B. MAY in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cartwright and Goodwin, Kidderminster, for Daffodils.
To Miss F. W. Currey, Lismore, Ireland, for Daffodils.
To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver-gilt Banksian Medal.

To Rev. G. H. Engleheart, V.M.H., Dinton, Salisbury, for new Daffodils.
To Mr. Alex. M. Wilson, Shovel, for new Daffodils.

Silver Flora Medal.

To Mr. F. H. Chapman, Rye, Sussex, for Daffodils.
To Mr. J. A. Cooper, Lissadell Bulb Farm, Sligo, for Daffodils.

Silver Banksian Medal.

To Messrs. Hogg and Robertson, Mary Street, Dublin, for Daffodils.
To Messrs. Bath, Wisbech, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Matthew Arnold' (votes, 9 for, 2 against), a fine *poeticus* variety, from Messrs. Cartwright and Goodwin.

Other Exhibits.

Mr. Frank Lilley, Guernsey: Daffodils.
Messrs. Robt. Sydenham, Birmingham: Daffodils.
Mr. W. A. Watts, Bronwylfa, St. Asaph: Seedling Daffodils.

BARR CUP COMPETITION.

The competition for the Barr Silver Cup, presented by Messrs. Barr for Daffodils, was held on this occasion. The Cup was won by the Rev. G. P. Haydon, Westbere, Canterbury; the Rev. Canon Fowler, Earley Vicarage, Reading, was the other exhibitor.

NARCISSUS AND TULIP COMMITTEE, MAY 3, 1910.

Mr. H. B. MAY in the Chair, and seventeen members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver Flora Medal.

To Messrs. Cartwright and Goodwin, for Daffodils.

Silver Banksian Medal.

To Messrs. Sydenham, Birmingham, for Daffodils.

Award of Merit.

To *Narcissus* 'Mrs. Norman Cookson' (votes, unanimous), a white, giant *Leedsii* variety, from Mrs. Norman Cookson (gr. Mr. H. J. Chapman), Oakwood, Wylam-on-Tyne. This was sent as *Narcissus Cooksoniae*, but the name was subsequently altered. (Fig. 158.)

To *Narcissus* 'Colleen' (votes, 10 for, 2 against), a pure white variety with pretty yellow-green cup, from Messrs. R. Wallace, Colchester. (Fig. 159.)

Other Exhibits.

Messrs. R. H. Bath, Wisbech: Daffodils and Tulips.
Mr. Frank Lilley, Guernsey: Tulips.
Messrs. R. Wallace, Colchester: Tulips.
Miss F. W. Currey, Lismore, Ireland: late-flowering Daffodils.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA, LONDON."

TELEPHONE: 5363 WESTMINSTER.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

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5. Subscriptions.
6. Form of Bequest.
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8. List of Fellows.
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33. Alterations in Rules for Judging.
34. Spraying of Fruit Trees.
35. Varieties of Fruits.
36. List of Plants Certificated.
37. International Horticultural Exhibition, 1912.
38. Recognition of Diligent Interest in Plants.
39. Lizards Wanted.
40. Poppy Seed.
41. Plant Labelling.
42. Advertisements.

ROYAL PATRONS.

Fellows will learn with much pleasure that their Imperial Majesties King George V. and Queen Mary have graciously consented to become Patrons of the Society.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 WESTMINSTER.**
"**HORTENSIA, LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted:—

VOLUME V. Part 1.
VOLUME X.
VOLUME XIII. Part 1.

These are therefore particularly asked for.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1st of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1st. It may be a week or more before the Tickets reach the Fellow, owing to the very large number, over 20,000, to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ , to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of

my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 68 in the "Book of Arrangements," 1910.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL (see advertisement pages 32 and 33) and the "Book of Arrangements."

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows is due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, in the North of England especially, as well as in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the number of Fellows.
2. Helping to swell the General Prize Fund started by Mr. A. W. Sutton, V.M.H., for providing Prizes for the Students at Wisley.
3. Providing lectures with lantern slides.
4. Presenting books to fill the gaps in the Library both at Vincent Square and at Wisley.
5. Sending new and rare Plants and Seeds for the Garden and surplus roots for distribution to the Fellows.

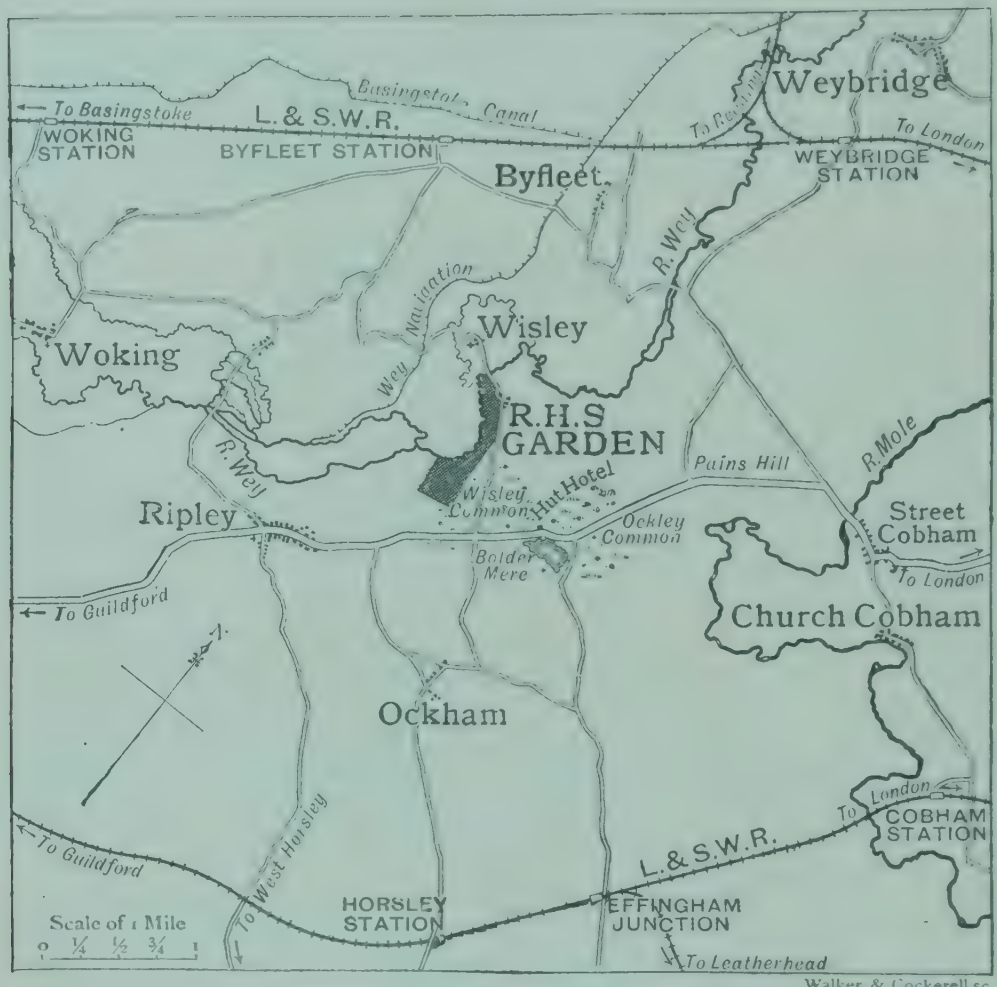
Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary, therefore, asks those who read these lines to do their best to help in any of the ways above indicated.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

11. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition days. Each Fellow's ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White,



POSITION OF THE SOCIETY'S GARDENS.

fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s*.; or waiting three hours 10*s*.; or to and from Horsley, 7*s*.; Effingham Junction, 7*s*.; Byfleet, 7*s*. Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s*. by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 106.

12. TRIALS AT WISLEY IN 1911–12.

Trials of Fruits, Flowers, and Vegetables at the Wisley Gardens during 1911–12 have been arranged as follows :—

N.B.—Everything sent for trial *must be named*, and the name and address of the Sender attached.

Fruit.—Strawberries and raspberries, autumn fruiting. These trials will be continued.

Flowers.—Fuchsias for bedding and for the conservatory. Two plants of each to be sent in early March.

Begonias (fibrous), including summer and winter flowering and bedding varieties. Two plants of each to be sent in March.

Delphiniums. Two plants of each in February.

Dahlias (decorative), introduced into commerce since January 1, 1908. Two plants of each in May.

Primulas (hardy) for borders and rock work. Three plants of each in February.

Vegetables.—Carrots. ½ oz. of each early in February.

Cucumbers. 6 seeds of each in February.

Peas. 1 pint of each early in February.

Cabbages, Savoy. 1 packet of seed of each in March.

Potatos, 'mid-season' and 'late.' Each variety must be labelled as being 'mid-season' or 'late.' 20 tubers of each to be sent by February.

If sent by post: The Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

If sent by rail: The Superintendent, R.H.S. Gardens, Wisley, Horsley Station, L. & S.-W. R., with advice by post to the Superintendent.

13. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture, and Lecturer to the Students.

14. STUDENTS AT WISLEY.

The Society admits young men, between the ages of 16 and 22 years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also lectures, demonstrations, and elementary Horticultural Science in the Laboratory, whereby a practical knowledge of simple Garden Chemistry, Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students

can enter only at the end of September or at the end of March. Selected Students have also the advantage of attending certain of the Society's Shows and Lectures in London.

15. DISTRIBUTION OF SURPLUS PLANTS.

In a recent Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was therefore decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by ballot.

Fellows are therefore particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are of necessity *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is therefore obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their form properly.

16. HIRING OF THE SOCIETY'S HALL.

The Royal Horticultural Hall and Offices are situated in Vincent Square, which lies straight through Ashley Gardens from Victoria Street,

Position of the Society's Hall.

Westminster, and is about five minutes' walk from the Victoria and St. James's Park Stations.

Fellows are earnestly requested to make known among their friends and among other institutions that the Royal Horticultural Hall is available for Meetings, Shows, Exhibitions, Concerts, Conferences, Lectures, Balls, Banquets, Bazaars, Receptions, and other similar purposes. The Hall has a floor surface of 13,000 square feet. It is cool in summer and warm in winter. For a Concert it will seat 1,500, or for a public meeting 1,800. A Sound-board has been added, and it was recently said by one of the candidates in the parliamentary election that the Hall is now a place where speaking becomes easy and delightful. Full particulars for hiring may be obtained on application to the Secretary, R.H.S., Vincent Square, Westminster, S.W., with whom dates may be booked.

17. EXHIBITIONS, MEETINGS, AND LECTURES IN 1910.

The programme will be found in the "Book of Arrangements" for 1910. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (33) of halfpenny cards *ready addressed* to himself.

18. DATES FIXED FOR 1911.

Jan. 3, 17, 31
Feb. 14, 28
March 14 and 15 (Bulbs), 28
April 11, 25
May 9, 23 to 26 (Temple Show)
June 6, 20
July 4, 5, and 6 (Olympia), 18
August 1, 29
Sept. 12, 26 (Vegetable Show)
Oct. 10, 12 and 13 (Fruit Show), 24
Nov. 7, 21
Dec. 5

19. SPRING BULB SHOW, 1911.

The Council of the Royal Horticultural Society have accepted the offer of the following prizes from the General Bulb Growers' Society at Haarlem, to be competed for on March 14 and 15, 1911.

HYACINTHS.

*Division I.—For Amateurs.**

Class 3.—Eighteen Hyacinths, distinct.

1st Prize . .	£6 6*s.*	4th Prize . .	£3 3*s.*
2nd „ . .	£5 5*s.*	5th „ . .	£2 2*s.*
3rd „ . .	£4 4*s.*	6th „ . .	£1 1*s.*

Class 4.—Twelve Hyacinths, distinct.

1st Prize . .	£5 5*s.*	4th Prize . .	£2 2*s.*
2nd „ . .	£4 4*s.*	5th „ . .	£1 1*s.*
3rd „ . .	£3 3*s.*		

Class 5.—Six Hyacinths, distinct.

1st Prize . .	£2 2*s.*	3rd Prize . .	£1 1*s.*
2nd „ . .	£1 10*s.*	4th „ . .	10*s.*

Class 6.—Four pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour

* The Society recognizes only three divisions of growers:
1. Amateurs growing for their own use or pleasure, and employing assistance or otherwise.
2. Trade, growing for retail sale.
3. Market gardeners, growing wholesale for market.

from those of the other three pans. The bulbs need not have been actually grown in the pans they are shown in.

1st Prize . .	£4 4*s*.	3rd Prize . .	£2 2*s*.
2nd „ . .	£3 3*s*.	4th „ . .	£1 1*s*.

Division II.—For Trade Growers.

Class 7.—Collection of 100 Hyacinths in twenty-five named varieties, four blooms of each variety, grown in pots or glasses.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Class 8.—Collection of 120 Hyacinths in twelve varieties in pans, ten roots of one variety in each pan. The bulbs need not have been actually grown in the pans they are shown in.

Prize—The Gold Medal of the General Bulb Growers' Society at Haarlem.

Regulations.—For Classes 3, 4, and 5 each bulb must be in a separate pot (size optional). Classes 3, 4, 5, and 6 must all be single spikes; no spikes may be tied together. Exhibitors may compete in one only of the classes numbered 3, 4, and 5.

All bulbs must have been forced entirely in Great Britain or Ireland. All varieties must be correctly named.

The President and Council have also accepted the offer of prizes from Mr. Robert Sydenham, for award by them at the R.H.S. Spring Bulb Show on March 14 and 15, 1911, as follows:—

Bulbs Grown in Moss Fibre or Similar Material (Amateurs).

Six single Hyacinths in separate vases (not exceeding six inches in diameter), to be selected from any one of the following varieties: 'Enchantress,' 'Innocence,' 'Isabella,' 'Jacques,' 'Johan,' 'King of the Blues,' 'Koh-i-Noor,' 'Ornament Rose,' 'Princess May,' 'Queen of the Blues,' 'Roi des Belges,' 'Rose à Merveille,' 'Schotel.'

Prizes, 21*s*., 17*s*. 6*d*., 15*s*., 10*s*. 6*d*., 7*s*. 6*d*.

Six vases of Tulips (vases not exceeding seven inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Duchesse de Parma,' 'Fabiola,' 'Joost van Vondel,' 'Keizerskroon,' 'La Rêve,' 'Mon Tresor,' 'Prince of Austria,' 'Queen of the Netherlands,' 'Rose Gris de Lin,' 'Van der Neer,' 'Vermillion Brilliant,' 'White Joost,' 'Van Vondel.'

Prizes, 21*s*., 17*s*. 6*d*., 15*s*., 10*s*. 6*d*., 7*s*. 6*d*.

Six vases of Narcissi (vases not exceeding seven inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Blood Orange,' 'Bullfinch,' 'C. J. Backhouse,' 'Dairyman,' 'Emperor,' 'Glitter,' 'Horace,' 'Leonie,' 'Lilian,' 'Lulworth,' 'Madame de Graaf,' 'Red Flag,' 'Victoria,' 'White Lady.'

Prizes, 21*s*., 17*s*. 6*d*., 15*s*., 10*s*. 6*d*., 7*s*. 6*d*.

20. SUMMER SHOW, OLYMPIA, 1911.

Olympia, Kensington, has been engaged for the Society's Summer Show in 1911. The Show will be open on three days, viz.:—On July 4 and 5 until 10 P.M., and on July 6 until 6 P.M.

Holland House Park not being available, Olympia commends itself for the Show. The light is good, and the Hall has proportions which conduce to an effective display. Fellows will be afforded the comfort of broad gangways, dryness underfoot, and protection from the vagaries of weather.

Remaining open during the first two evenings at popular prices, opportunity to see the Show will be afforded to a large proportion of the public whose business hours prohibit an afternoon attendance.

Special particulars for the guidance of exhibitors will be issued in the "Book of Arrangements" for 1911. The fixtures at Olympia reduce the time for preparation to a narrow limit, and it will be therefore necessary for exhibitors of large groups to well and carefully consider their own special requirements beforehand.

A Twenty Guinea Cup has been offered to the Council by the New Olympia Company, Limited, and accepted by them for award at this Show.

21. BRITISH FRUIT AND VEGETABLES.

In 1911, instead of the system of scattering the prizes offered all through the year, they will be concentrated on two meetings, the Great Fruit Show being held on October 12 and 13, and the Vegetable Show being combined with the Ordinary Meeting on September 26. The Schedules of the Prizes will be ready in March next.

22. CHALLENGE CUPS FOR VEGETABLES.

A handsome Silver-gilt Challenge Cup has been presented to the Society by Messrs. Sutton, of Reading, and the Council will again offer it, with £10, for the best collection of twelve kinds of vegetables on September 26, 1911. The Society also offers a Champion Challenge Cup for the greatest number of points obtained by any one exhibitor throughout the same Exhibition, the winner of the Sutton Cup being excluded. These Cups may be won by the same exhibitor only once in four years, but he may compete every year for any second prize that may be offered.

23. SHOWS OF KINDRED SOCIETIES IN 1910.

The following dates have been fixed, on which R.H.S. Fellows' tickets will admit:—

March 23.—Stour Valley Gardening Society.
May 3.—Auricula and Primula Society.
May 17.—Tulip Society.
June 9.—Perpetual Flowering Carnation Society
July 12–13.—Sweet Pea Society.
July 26.—Carnation and Picotee Society.

September 15.—Rose Society.
September 28.—Vegetable Society.
December 13.—Carnation Society.

For Schedules of these Shows see under above dates in the "Book of Arrangements," 1910.

24. LECTURES.

The new Lecture Room is fitted with an electric lantern of the most modern construction; gas and water are laid on, and every provision has been made for the illustration and delivery of Lectures.

Any Fellows willing to Lecture, or to communicate Papers on interesting subjects, are requested to communicate with the Secretary.

25. "THE MASTERS LECTURES."

Fellows will remember the intimate connection with the Society of the late Dr. Masters, F.R.S., who did much for horticulture by drawing constant attention to the various ways in which scientific discovery and research might be made serviceable to gardening; and it will also be remembered that a fund was established by subscription to perpetuate his memory in connection with the Society and to carry on in some degree his work of science in relation to gardening. "The Masters Lectures" were accordingly founded, and the first two were given during 1909 by Professor Hugo de Vries, of Amsterdam.

In 1911 Professor G. F. Scott-Elliot, M.A., B.Sc., will be the Lecturer on February 28 and March 14.

26. EXAMINATIONS, 1911.

1. The Annual Examination in the Principles and Practice of Horticulture will be held on Wednesday, April 5, 1911. The examination has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Candidates must send in their names not later than March 22. Particulars for 1911 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1910 (price 2*s.* post free) may also be obtained from the Office. The Society is willing to hold an examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Society is prepared to extend this examination to residents in the Colonies; and, at the request of the Government of the United Provinces of India, it was held in 1910—altered and adapted to local requirements—at Saharanpur and Calcutta in India, and also in South Africa.

In connection with this examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1911 examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male

sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on Wednesday, April 26, 1911. This examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this examination is on similar lines to that of the more general examination. Questions on Elementary Chemistry and Biology are now added to this examination.

3. The Society will hold an Examination in the Royal Horticultural Hall, Vincent Square, S.W., on Monday, January 16, 1911, for gardeners employed in Public Parks and Gardens belonging to County Councils, City Corporations, and similar bodies. Entries close on January 2, 1911.

Medals and Certificates are awarded and Class Lists published in connection with these examinations. The Syllabus may be obtained on application to the Secretary R.H.S., Vincent Square.

27. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions by applying to the Secretary R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

28. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can be inspected only at the *written* request of the *owner*.

29. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of

local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 300 Societies have joined our ranks, and the number is steadily increasing.

The Parent Society offers annually a Silver Challenge Cup to be competed for by Affiliated Societies. (See "Book of Schedules," under date October 13 and 14.)

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

30. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A new and revised list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary R.H.S., price 3*d.*

Lantern slides on horticultural topics are much needed, and their gift will be appreciated.

31. COLOUR CHART.

Hardly a gardener or florist exists who has not at times longed for a Colour Chart—that is to say, for a standard of reference whereby he could himself name, or recognize, or convey to a friend at a distance, the *exact* shade of colour of a flower he desired to procure or had seen advertised, or wished to commend to a friend. Take, for example, the word "crimson"; what a multitude of colours and shades it may be made to include! Some, very beautiful; some, horrible concoctions of red and blue crudely combined.

The Council of the Society have long felt the need of such a Colour Chart, but the huge expense of production has hitherto deterred them from issuing it.

Not long since an admirable chart, containing more than 1,450 shades of colour between white and black, was published at the instance of the French Chrysanthemum Society, the price being £1 1*s.* net, and by it

it is now possible to *exactly* recognize or describe to a friend or purchaser at a distance the precise colour of any possible flower. You may have met with an Azalea, for instance, which greatly strikes your fancy; you take out your Chart and match its shade, and describe it to your friend or your nurseryman as, "Colour: Apricot, p. 53, shade 3," and he turns to his Chart and sees *exactly* what it is you want or describe. Or you want to make someone understand the exact shade of a rose in the way of "Andersoni," and you need only say, "Rosy pink, p. 118, shade 1," and your correspondent turns to his Chart and sees in a moment exactly what it is you want to describe. Or a nurseryman, having raised a new variety, can by simply quoting "Colour Chart, p. —, shade —," exactly represent to his customers the colour-beauty of his new introduction.

The Council, recognizing both the excellence and the usefulness of this Chart, the idea at once occurred: Could it not be adopted as an International Standard, so that all lovers of flowers all over the world could accurately and exactly describe to one another (no matter how far away or speaking what language) the colour and shade of any particular flower they refer to? There seemed no other difficulty than the somewhat prohibitive cost of £1 1*s*. net. But difficulties only exist to be overcome, and by undertaking to be responsible for a very large number the Society is now in a position to offer this Chart to its Fellows at the reduced cost of 14*s*. 6*d*., for which price it can be obtained at the Society's Offices, Vincent Square, or it can be sent free by post for 15*s*.; but in all cases a cheque or postal order must be sent beforehand.

This Chart will, of course, be found vastly useful for many other purposes; for example, a lady wishing to match a certain shade has only to refer her dressmaker to such and such a colour on p. —, shade —, and it can be infallibly matched. An artist wishing to describe the colour of the sky on a certain sundown can do so exactly by reference to the Chart. And in many other like ways it must prove generally useful, containing as it does every possible shade of colour between black and white.

This Chart is being adopted extensively by dyers, mercers, drapers, and others, in all countries, as a result of its introduction through our Society.

A large and rapid sale has already been created, and the Council hope that Fellows will avail themselves freely of this offer, as there is now a real prospect of its being very widely adopted as a regular International standard. It should be quoted as "The Royal Horticultural Society's Colour Chart."

32. MONOGRAPH ON FUNGOID PESTS.

The attention of Fellows is directed to a handsome volume published by the Society on "Fungoid Pests of Cultivated Plants," by Dr. M. C. Cooke, V.M.H. It consists of 280 pages of letterpress, and is illustrated with 24 coloured plates, containing figures of 360 different fungoid attacks, and 23 woodcuts. It also contains a Chapter on Fungicides, which explains clearly how to make the different washes and sprays, and gives the proportions in which the various ingredients should be used. The whole work is written so as to interest and instruct the

cultivator in the simplest and most practical manner. The volume makes an admirable school prize or gift to a gardener or student of nature. Price 5*s*., R.H.S. Office, Vincent Square.

"No one whose plants are subject to fungoid attacks—and whose are not?—should be without this book; for not only can they by its use identify the disease at once, but they are also told both how to treat it and overcome it, and also how to make the different washes and sprays which the different classes of fungoid attacks require."

33. ALTERATIONS IN RULES FOR JUDGING—1909 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," were revised and considerably modified in 1909. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The secretaries of local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s*. 6*d*., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the revised Rules (1909 Code) have been still further modified, and will until further notice stand as follows:—

	Specimens		Specimens
Asparagus	36	Marrows	3
Beets	9	Mushrooms	12
Broad Beans	24	Onions	12
Broccoli	6	Parsnips	12
Brussels Sprouts	36	Peas	36
Cabbages	3	Potatos	12
Carrots	12	Radish	24
Cauliflower	6	Runner Beans	24
Celery	6	Seakale	12
Cucumber	2	Shallots, large bulbs	24
French and Climbing Beans	36	„ small clusters	3
Kale, whole stem, to show habit	3	Tomatos	12
Leeks	12	Turnips	12
Lettuce and Endive	6		

34. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s*. The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

35. VARIETIES OF FRUITS.

Many people plant Fruit trees without a thought of what Variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d.* they can obtain from the Society a little 16-page pamphlet which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of Fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d.*, or 25, 2*s.*; 50, 3*s.*; 100, 4*s.*

36. PLANTS CERTIFICATED.

The last published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further 10 years have now passed and the Council have decided to republish the list up to date, constituting a record of all the plants which have received awards during the past 50 years. The completed list will be of welcome assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It will be ready as soon after the close of the year as possible, price 2*s.* post free.

Orchids Certificated.

The list of awards made to Orchids has recently been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s.* net.

37. INTERNATIONAL HORTICULTURAL EXHIBITION, MAY 22–30, 1912.

Most of the Fellows of the Society will have already heard with pleasure that a Committee has been formed to organize an International Flower Show in London in the spring of 1912, as the outcome of a suggestion made by the Secretary of the Society that such a courtesy on the part of Great Britain was due (or indeed overdue) to the Continent and to America for the many similar hospitalities which foreign countries have offered to British horticulturists.

The Executive Committee now consists of prominent people of various professions and callings (including several leading gardeners), in whom every confidence may be placed to bring the proposal to a satisfactory conclusion on points of organization, exhibits, and finance. A large number of the nobility and gentry have lent their names to the scheme, together with many men of position and renown in science.

It must be fully understood and constantly borne in mind that the Royal Horticultural Society is not organizing the Exhibition, and that for many excellent reasons. Fellows are, therefore, asked from the very beginning to recognize the Exhibition as being absolutely distinct from the Society, being, in fact, an entirely separate and independent organization. The Society has, however, most warmly welcomed the proposal that such an International Exhibition should be held, and it will render the Exhibition Committee every assistance in its power.

The Exhibition Committee, recognizing the importance of securing the great weight of horticultural interest vested in the Society, have approached the Council with a view to establishing a suitable friendly working arrangement between the two bodies. Negotiations have accordingly been actively proceeding, whereby it has been decided that—

(*a*) The Royal Horticultural Society agrees—

1. To forego in 1912 its great Spring Show hitherto held, by kind permission of the Master and Benchers, in the gardens of the Inner Temple;
2. To contribute £1,000 towards the expenses of promoting the International Exhibition; and
3. To guarantee a further sum of £4,000 against the hardly probable contingency of there being an ultimate loss on the Exhibition.

(*b*) The Executive Committee of the International Exhibition, 1912, agrees—

1. To give to all Fellows of the Society certain special and definite privileges (to be published in due time) over the general public in regard to the purchase of tickets for the Exhibition; and
2. To allow all such tickets purchased by Fellows of the Society to be transferable.

Fellows are particularly requested not to write to the Society on the subject of the Exhibition, or of tickets therefor, until the definite privileges accorded by the Exhibition Committee to the Fellows of the Society have been published.

38. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of approval of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden plot keeping, or nature study, has secured the first prize. The cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W. (price 6*d*. each), by the head master or mistress and a member of the educational authority concerned. The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number

of prizes awarded in the competition, (*c*) the full name of the first prize winner. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

39. LIZARDS WANTED.

The Secretary of the Society has a great desire to reintroduce the common "scaly lizard" of English heaths and gorse commons in a neighbourhood where it once was common but from which it has in recent years disappeared. Would any Fellow of the Society living in a district where the lizard is abundant be so very kind as to catch half a dozen or so, and send them by post in a tin box *with air holes*, addressed Rev. W. Wilks, Shirley Vicarage, Croydon? The box must not be wrapped in paper, or the inhabitants will get no air and die. It should have a little grass and a few sprays of heather inside, and be simply tied round tightly with string and several *small* holes made in each side for air to enter freely. Mr. Wilks will be vastly grateful to any sender, and will give the little strangers a hearty welcome and introduce them to a gloriously sunny bank with rough stones to lie under and plenty of heather and gorse near by, with flies and beetles in abundance and no children to break off their tails. Although the lizard is so common in very many parts of Great Britain, Mr. Wilks has as yet only had two specimens sent to him! Yet Fellows by the thousand take advantage of his offer of Shirley Poppy Seed.

40. POPPY SEED.

The Secretary will be pleased to send a packet of his 1910 crop of Shirley Poppy Seed to any Fellows who like to send to Rev. W. Wilks, Shirley Vicarage, Croydon, a stamped envelope ready addressed to themselves. The seed should be sown as early as possible in March. This is an offer made by the Secretary in his private capacity, and it causes much inconvenience when requests for seed are mixed up with letters sent to the office in London instead of as above directed.

41. PLANT LABELLING.

Complaints are frequently received from Fellows to the effect that plants in groups are insufficiently or too inconspicuously labelled. The Secretary therefore urges that name cards affixed to plants be boldly and plainly printed, or written in print-like letters.

42. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

SEPTEMBER 13, 1910.

Sir ALBERT KAYE ROLLIT, LL.D., D.C.L., in the Chair.

Fellows elected (3).—E. Berryman, Mrs. C. S. Hunting, Rudolph Wicke.

A lecture on "Rambling Roses" was given by Mr. George Paul, jun. (see p. 529).

GENERAL MEETING.

SEPTEMBER 27, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair.

Fellows elected (67).—Mrs. H. Agnew, Mrs. J. Aldridge, Lady Emily Alexander, J. A. Alexander, Mrs. Austin, Mrs. H. Balfour, J. W. Bamber, J. S. Harmood Banner, M.P., Mrs. H. Barber, Mrs. C. E. Barron, Mrs. Bell-Irving, Lady Bonham, Miss Chater, Hon. Mrs. A. Chichester, S. G. Cirket, Mrs. Stewart Clark, E. H. Crisp, R. Dalrymple, Mrs. H. Drummond, Miss M. Fass, Mrs. C. McG. Frame, Mrs. Greet, Mrs. C. R. Hargreaves, Miss H. Hayes, G. A. Hockley, Mrs. J. McK. Hooper, Captain J. A. Innes, D.S.O., F. T. Jefferson, J.P., David Jones, The Earl of Kenmare, Mrs. E. J. Lewis, Mrs. M. Lilley, Mrs. L. Lyons, K. McRae, The Duchess of Manchester, Mrs. J. F. Marshall, R. F. Miller, P. E. Newberry, M.A., Major J. R. Pease, Mrs. E. R. Porter, Miss E. Ramsbottom, Mrs. M. L. Rashdall, Mrs. G. H. Raw, E. Raworth, Mrs. H. Reynolds, Miss Ritchie, Miss K. Ross, H. B. Rowe, Mrs. Rutter, Mrs. Guy St. Aubyn, Lady St. Levan, R. W. Skipwith, Earl Stanhope, A. Stapleton, H. Strudwick, Major-General Sir R. Talbot, K.C.B., W. J. Thompson, J. W. Thornley, Sir Edgecombe Venning, Miss A. E. Wallace, Mrs. Weldon, W. C. A. Williams, George Winch, Mrs. Wolryche-Whitmore, A. C. Wood, R. M. Wood, Miss J. K. Young.

Fellows resident abroad (4).—Professor H. Hara (Japan), A. J. Logsdail (Canada), K. Matsura (Japan), Professor N. Yamasaki (Japan).

Associates (4).—Miss I. Brown, W. Buckingham, W. E. Humphreys, G. J. Lovelock.

Society affiliated (1).—Timaru Horticultural Society.

A lecture on "South America in its relations to Horticulture" was given by Mr. Arthur W. Hill, M.A.

GENERAL MEETING.

October 11, 1910.

Sir Albert Kaye Rollit, LL.D., D.C.L., in the Chair.

Fellows elected (25).—E. H. Athell, Mrs. G. G. Beggs, W. Cleaver, Mrs. G. A. Cohen, T. F. Crozier, Mrs. Vaughan Davies, Mrs. L. Dunn, Mrs. H. Fenton, Miss A. N. Fotheringham, F. W. Gallop, Miss G. Gardner, Mrs. Warwick Hunt, Mrs. G. Johnston, Mrs. D. Maclean, Mrs. L. Mundy, Mrs. J. Preston, F. Rigby, Mrs. Vernon Smith, Rev. E. H. Stewart, Mrs. Slingsby Tanner, Miss A. F. Tennant, Dr. J. D. Thomson, Dr. J. J. L. van Ryn, Mrs. J. Vaughan, Mrs. W. Whately.

A lecture on "Cider and Perry Fruits" was given by Mr. B. T. P. Barker, M.A. (see p. 565).

SIXTEENTH ANNUAL EXHIBITION OF BRITISH-GROWN FRUIT.

Held at the Society's Hall, Vincent Square, S.W., October 13 and 14, 1910.

THE JUDGES.

Allan, W., Gunton Park Gardens, Norwich.
Arnold, T., Cirencester Park Gardens, Gloucester.
Bacon, W. H., Mote Park Gardens, Maidstone.
Barnes, N. F., Eaton Gardens, Chester.
Barnes, W., Bearwood Gardens, Wokingham.
Basham, J., Bassaleg, Newport, Mon.
Bates, W., Cross Deep Gardens, Twickenham.
Beckett, E., V.M.H., Aldenham House Gardens, Elstree.
Bowerman, J., Southgate Manor Gardens, Reading.
Challis, T., V.M.H., Wilton House Gardens, Salisbury.
Cheal, J., Crawley, Sussex.
Coomber, T., V.M.H., The Hendre Gardens, Monmouth.

Cornford, J., Quex Park Gardens, Birchington.
Crouch, C., St. Ann's Hill Gardens, Chertsey.
Crump, W., V.M.H., Madresfield Court Gardens, Malvern.
Davis, J., Glebelands Gardens, S. Woodford.
Dean, A., V.M.H., 62 Richmond Road, Kingston.
Divers, W. H., Belvoir Castle Gardens, Grantham.
Doe, J., Rufford Gardens, Ollerton, Notts.
Douglas, J., V.M.H., Great Bookham, Surrey.
Earp, W., Bayham Abbey Gardens, Lamberhurst.
Fielder, C. R., V.M.H., North Mymms Park Gardens, Hatfield.
Foster, C., Expt. Station, Sutton Green, Guildford.
Fyfe, W., Lockinge Park Gardens, Wantage.
Gibson, J., Welbeck Abbey Gardens, Worksop.
Goodacre, J. H., V.M.H., Elvaston Castle Gardens, Derby.
Jaques, J., Grey Friars, Chorley Wood, Herts.
Lyne, J., Foxbury Gardens, Chislehurst.
MacKellar, A., V.M.H., Royal Gardens, Windsor.
Markham, H., Wrotham Park Gardens, High Barnet.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishop's Waltham
Moore, F. W., V.M.H., Botanic Gardens, Glasnevin.
Mortimer, S., Rowledge, Farnham, Surrey.
Paul, G., J.P., V.M.H., Cheshunt, Herts.
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Pope, W., Welford Park Gardens, Newbury, Berks.
Poupart, W., Marsh Farm, Twickenham.
Reynolds, G., Gunnersbury Park Gardens, Acton, W.
Rivers, H. S., Sawbridgeworth.
Ross, C., V.M.H., Liveridge Hill, Henley-in-Arden.
Salter, C. J., Normanhurst Gardens, Rusper, Horsham.
Smith, J. R., Bedgebury Park Gardens, Goudhurst, Kent.
Veitch, P. C. M., J.P., New North Road, Exeter.
Vert, J., Audley End Gardens, Saffron Walden.
Walker, J., The Farm, Ham Common, Surrey.
Ward, A., Godinton Gardens, Ashford, Kent.
Weston, J. G., Eastwell Park Gardens, Ashford, Kent.
Woodward, G., Barham Court Gardens, Teston, Maidstone.
Wythes, G., V.M.H., Briccalees, Bovingdon, Herts.

THE REFEREES.

Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Hudson, J., V.M.H., Gunnersbury House Gardens, Acton, W
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.

OFFICIAL PRIZE LIST.

(The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.)

Division I.

Fruits grown under Glass or otherwise.

Open to Gardeners and Amateurs only.

Note.—Exhibitors can compete in one Class only of Classes 1, 2, and of Classes 3, 4.

Class 1.—Collection of 9 dishes of Ripe Dessert Fruit:—6 kinds at least; only 1 Pine, 1 Melon, 1 Black and 1 White Grape allowed; not more than two varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Cup and £5; Second, £5; Third, £3.

1. C. A. Cain, Esq., The Node, Welwyn (gr. T. Pateman).
2. J. A. Nix, Esq., Tilgate, Crawley (gr. E. Neal).
3. No award.

Class 2.—Collection of 6 dishes of Ripe Dessert Fruit:—4 kinds at least; only 1 Melon, 1 Black and 1 White Grape allowed; not more than two varieties of any other kind, and no two dishes of the same variety. Pines excluded.

First Prize, Silver Cup and £3; Second, £3; Third, £2.

1. Lord Belper, Kingston Hall, Derby (gr. W. H. Cooke).
2. Duke of Newcastle, Clumber Park, Worksop (gr. S. Barker).
3. { Sir C. E. Hamilton, Bart., Hatley Park, Sandy, Beds. (gr. T. W. Birkinshaw). / H. St. Maur, Esq., Stover Park, Newton Abbot (gr. G. Richardson). } equal.

Class 3.—Grapes, 5 distinct varieties, 2 bunches of each, of which two at least must be White.

First Prize, Silver Cup and £3 10*s.*; Second, £4.

No entry.

Class 4.—Grapes, 4 varieties, selected from the following: 'Madresfield Court,' 'Mrs. Pince,' 'Muscat Hamburgh,' 'Muscat of Alexandra' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg,' 2 bunches of each.

First Prize, Silver Cup and £3; Second, £3.

1. No award.
2. A. Benson, Upper Gatton Park, Merstham (gr. H. Cornish).
3. No award.

Class 5.—Grapes, ' Black Hamburgh,' 2 bunches.
First Prize, £1 10*s.*; Second, £1; Third, 10*s.*
1. Lord Hillingdon, Wildernesse, Sevenoaks (gr. J. Shelton).
2. J. A. Nix. Esq.
3. No award.

Class 6.—Grapes, ' Mrs. Pince,' 2 bunches.
First Prize, £1 10*s.*; Second, £1.
1. Lord Hillingdon (gr. J. Shelton).
2. H. St. Maur, Esq.

Class 7.—Grapes, ' Alicante,' 2 bunches.
First Prize, £1 10*s.*; Second, £1; Third, 10*s.*
1. Duke of Newcastle.
2. W. G. Raphael, Esq., Castle Hill, Englefield Green (gr. H. H. Brown).
3. Sir Walpole Greenwell, Bart., Marden Park, Surrey (gr. W. Lintott).

Class 8.—Grapes, ' Madresfield Court,' 2 bunches.
First Prize, £1 10*s.*; Second, £1; Third, 10*s.*
1. Duke of Newcastle.
2. Lord Belper.
3. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).

Class 9.—Grapes, ' Prince of Wales,' 2 bunches.
First Prize, £1 10*s.*; Second, £1.
1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
2. No award.

Class 10.—Grapes, any other Black Grape, 2 bunches.
First Prize, £1 10*s.*; Second, £1.
1. Duke of Newcastle.
2. C. A. Cain, Esq.

Class 11.—Grapes, ' Muscat of Alexandria,' 2 bunches.
First Prize, £2; Second, 25*s.*; Third, 15*s.*
1. L. G. Pike, Esq., Wareham, Dorset (gr. W. D. Pope).
2. G. Miller, Esq.
3. A. Benson, Esq.

Class 12.—Grapes, any other White Grape, 2 bunches.
First Prize, £1 10*s.*; Second, £1; Third, 10*s.*
1. No award.
2. Sir C. E. Hamilton, Bart.
3. A. Benson, Esq.

Class 13.—Grapes, 2 bunches of any two Frontignan Varieties.
First Prize, £1 10*s.*; Second, £1.
1. No award.
2. W. E. Hyde, Esq., Norwood Hall, Sheffield.

Class 14.—Collection of Hardy Fruits, in a space not exceeding 12′ × 3′:—30 dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, The Hogg Medal and £3; Second, £2; Third, £1.

1. Col. Borton, Cheveney, Hunton, Kent (gr. J. Whittle).
2. Major Powell-Cotton, Quex Park, Isle of Thanet (gr. J. Cornford).
3. Sir Marcus Samuel, Bart., Mote Park, Maidstone (gr. W. H. Bacon).

Division II.

Open to Nurserymen only.

Nurserymen and Market Growers must exhibit as individuals or as firms. *They must have actually grown all they exhibit.* Combinations of individuals or firms are not allowed, nor the collection of produce from different districts.

Nurserymen and Market Growers desiring to exhibit at this show must make application for space as under Class 15 or 16 or 17 or 18; 19, 20; 21 or 22 or 23. No other spaces but the above can be allotted. Exhibitors can enter in only one of Classes 15 to 18; or in one of 21, 22 and 23.

Nurserymen and Market Growers may adopt any method of staging they desire. The use of berries and foliage plants is allowed for decoration but not flowers.

No Awards will be made to Nurserymen and Market Growers who do not conform to the regulations.

Important.—Nurserymen and Market Growers having entered and finding themselves unable to exhibit are particularly requested to give four days' notice to the Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey. Telegraphic Address—"Hortensia, Ripley."

Allotment of table-space will be made on the following scales :—

For Fruit grown entirely out of doors.

Class 15.—30 feet run of 6 feet tabling.

Messrs. G. Bunyard, Maidstone: Gold Medal.
King's Acre Nurseries, Hereford: Gold Medal.
Messrs. H. Cannell, Swanley: Silver-gilt Knightian Medal.
Messrs. J. Cheal, Crawley: Silver-gilt Knightian Medal.

Class 16.—20 feet run of 6 feet tabling.

Messrs. W. Seabrook, Chelmsford: Silver-gilt Hogg Medal.
Mr. R. C. Notcutt, Woodbridge: Silver-gilt Knightian Medal.
Messrs. Laxton, Bedford: Silver-gilt Banksian Medal.
Messrs. Spooner, Hounslow: Silver Knightian Medal.

Class 17.—12 feet run of 6 feet tabling.

Mr. W. Tayler, Hampton: Silver-gilt Knightian Medal.
Barnham Nurseries, Barnham: Silver-gilt Banksian Medal.
Messrs. J. Peed, West Norwood: Silver Banksian Medal.
Messrs. R. Veitch, Exeter: Silver Banksian Medal.

Class 18.—6 feet run of 6 feet tabling.

No entry.

For Orchard House Fruit and Trees.

Class 19.—24 feet by 6 feet of stage. Grapes excluded.
Messrs. T. Rivers, Sawbridgeworth: Gold Medal.
Messrs. G. Bunyard, Maidstone: Silver-gilt Hogg Medal.

Class 20.—9 Vines, growing in pots, not less than three varieties.
No entry.

Division III.

Open to Market Growers only.

Class 21.—18 feet run of 6 feet tabling.
Mr. A. Poupart, Twickenham: Silver-gilt Medal of Fruiterers' Company.
Kentish Fruit Growers' Union, Maidstone: Bronze Banksian Medal.

Class 22.—12 feet run of 6 feet tabling.
Mr. G. H. Dean, Sittingbourne: Silver Medal of Fruiterers' Company.
Mr. H. T. Mason, Hampton Hill: Silver-gilt Knightian Medal.
Horticultural College, Swanley: Silver Banksian Medal.

Class 23.—Apples, 12 dishes distinct, 6 Cooking, 6 Dessert; Exhibitors in Classes 21 and 22 not admissible.
First Prize, £2; Second, £1 10*s.*; Third, £1.
1. Mr. R. A. Whiting, Faversham.
2. Mr. A. E. Mason, Hampton.
3. Mr. A. G. Carter, Billingshurst.

Extra 3. Miss K. M. Courtauld, Colne Engaine.

Division IV.

Fruits grown entirely in the open air—except Class 36.

Open to Gardeners and Amateurs only.
Nurserymen and Market Growers excluded.

Exhibitors of Apples or Pears in Division IV. are excluded from Division VI.

Note.—Exhibitors can compete in one class only of the Classes 24, 25, 26; of 29, 30, 31, 32.

Class 24.—Apples, 24 dishes distinct, 16 Cooking, 8 Dessert. The latter to be placed in the front row.
First Prize, Veitch Memorial Medal and £5; Second, £3; Third, £2.
1. Col. Borton.
2. C. Gurney, Esq., Henlow Grange, Biggleswade, Beds. (gr. A. Carlisle).
3. Sir Edmund G. Loder, Bart., Leonardslee, Horsham (gr. W. A. Cook).

Class 25.—Apples, 18 dishes distinct, 12 Cooking, 6 Dessert. The latter to be placed in the front row.

First Prize, £3; Second £2; Third, £1.

1. J. G. Williams, Esq., Pendley Manor, Tring (gr. F. G. Gerrish).
2. Sir Marcus Samuel, Bart.
3. Major Powell-Cotton.

Class 26.—Apples, 12 dishes distinct, 8 Cooking, 4 Dessert. The latter to be placed in the front row.

First Prize, £2; Second, £1; Third, 15*s*.

1. Mr. A. Basile, Woburn Park, Weybridge.
2. J. A. Nix, Esq.
3. No award.

Class 27.—Cooking Apples, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. Col. Borton.
2. C. Gurney, Esq.

Class 28.—Dessert Apples, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. Col. Borton.
2. C. Gurney, Esq.

Class 29.—Dessert Pears, 18 dishes distinct.

First Prize, a Hogg Medal and £2; Second, £2; Third, £1.

1. Sir Marcus Samuel, Bart.
2. F. A. White, Esq., Oakleigh, East Grinstead.
3. Col. Borton.

Class 30.—Dessert Pears, 12 dishes distinct.

First Prize, £2; Second, £1; Third, 15*s*.

1. Mr. A. Basile.
2. Major Powell-Cotton.
3. The American Ambassador, Wrest Park, Ampthill, Beds. (gr. G. Mackinley).

Class 31.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10*s*.; Second, 17*s*. 6*d*.

1. J. A. Nix, Esq.
2. No award.

Class 32.—Dessert Pears, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. J. Brennand, Esq., Baldersby Park, Thirsk, York (gr. G. Hathaway).
2. B. Crayden, Esq., 78A East Street, Sittingbourne.

Class 33.—Stewing Pears, 3 dishes distinct.

First Prize, 15*s*.; Second, 10*s*.

1. B. Crayden, Esq.
2. Major Powell-Cotton.

Class 34.—Peaches, grown entirely out of doors, 1 dish of one variety.

First Prize, 10*s.*; Second, 7*s.*

1. Duke of Richmond, Goodwood, Sussex (gr. F. Brock).
2. Viscount Enfield, Wrotham Park, Barnet (gr. H. Markham).

Class 35.—Nectarines, grown entirely out of doors, 1 dish of one variety.

First Prize, 10*s.*; Second, 7*s.*

1. The American Ambassador.
2. Major Powell-Cotton.

Class 36.—Plums grown under Glass, 3 dishes distinct.

First Prize, £1; Second, 10*s.*

1. Lord Howard de Walden, Audley End, Saffron Walden (gr. J. Vert).
2. Mrs. Bankes, Kingston Lacy, Wimborne, Dorset (gr. J. Hill).

Class 37.—Plums (outdoors), 3 dishes distinct.

First Prize, 15*s.*; Second, 10*s.*

1. C. H. Berners, Esq., Woolverstone Park, Ipswich (gr. W. Messenger).
2. Lord Howard de Walden.

Class 38.—Plums, 1 dish of Coe's Golden Drop.

First Prize, 7*s.*; Second, 5*s.*

1. C. H. Berners, Esq.
2. Lord Howard de Walden.

Class 39.—Plums, 1 dish of any other Dessert variety.

First Prize, 7*s.*; Second, 5*s.*

1. Marquis of Northampton, Castle Ashby, Northampton (gr. A. R. Searle).
2. C. H. Berners, Esq.

Class 40.—Plums, Cooking, 1 dish of one variety.

First Prize, 7*s.*; Second, 5*s.*

1. C. H. Berners, Esq.
2. Lord Howard de Walden.

Class 41.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10*s.*; Second, 7*s.* 6*d.*

No entry.

Class 42.—Morello Cherries, 50 fruits.

First Prize, 7*s.*; Second, 5*s.*

1. J. G. Williams, Esq.
2. No award.

Division V.

Special District County Prizes.

Open to Gardeners and Amateurs only.

(In this Division all Fruit must have been grown entirely in the Open.)

N.B.—Exhibitors in Division V. must not compete in Divisions II. or III., or in Classes 1, 2, 3, 4, 14, 24, 25, 26, 29, 30, 31.

Class AA.—Apples, 6 dishes distinct, 4 Cooking, 2 Dessert.
1st Prize, £1 and 3rd class Single Fare from Exhibitor's nearest railway station to London;* 2nd Prize, 15*s.* and Railway Fare as above.

Class BB.—Dessert Pears, 6 dishes distinct.
1st Prize, £1 10*s.* and Railway Fare as above;* 2nd Prize, £1 and Railway Fare as above.*

The two Classes, Nos. AA and BB, are repeated 11 times as follows, and Exhibitors must enter for them thus: "Class AA 43" or "BB 44," and so on, to make it quite clear whether they mean Apples or Pears.

* In the event of the same Exhibitor being successful in both classes AA and BB only one Railway Fare will be paid; and no Railway Fare will be paid if the fruit is sent up for the Society's officers to unpack and stage.

Class 43.—Open only to Kent Growers.

AA. 1. W. E. S. E. Drax, Esq., Olantigh Towers, Wye, Kent (gr. J. Bond).
2. Rev. H. A. Bull, Wellington House, Westgate-on-Sea (gr. F. King).

BB. 1. W. E. S. E. Drax, Esq.
2. Lord Hillingdon (gr. J. Shelton).

Class 44.—Open only to Growers in Surrey, Sussex, Hants, Dorset, Somerset, Devon, and Cornwall.

AA. 1. Duke of Richmond.
2. F. J. B. Wingfield-Digby, Esq., Sherborne Castle, Dorset (gr. T. Turton).

BB. 1. F. J. B. Wingfield-Digby, Esq.
2. C. H. Combe, Esq., Cobham Park, Surrey (gr. A. Tidy).

Class 45.—Open only to Growers in Wilts, Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA. 1. Lord Hillingdon, Hillingdon Court, Uxbridge (gr. A. R. Allan).
2. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).

BB. 1. Lord Hillingdon (gr. A. R. Allan).
2. Viscount Enfield.

Class 46.—Open only to Growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA. 1. Col. Petre, Westwick House, Norwich (gr. G. D. Davison).
2. W. A. Voss, Esq., Eastwood Road, Rayleigh, Essex.

BB. 1. Col. Petre.
2. C. H. Berners, Esq.

Class 47.—Open only to Growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA. 1. Duke of Rutland, Belvoir Castle, Grantham (gr. W. H. Divers).
2. J. Lee, Esq., Kingscroft, Higher Bebington, Cheshire.

BB. 1. Duke of Portland.
2. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. J. Taylor).

Class 48.—Open only to Growers in Worcester, Hereford, Monmouth, Glamorgan, Carmarthen, and Pembroke.

AA. 1. D. Best, Esq., Temple Laugherne, Worcester.
2. G. H. Hadfield, Esq., Moraston House, Ross, Hereford (gr. J. Rick).

BB. 1. G. H. Hadfield, Esq.
2. No award.

Class 49.—Open only to Growers in the other Counties of Wales.

AA. 1. P. Yorke, Esq., Erddy Park, Wrexham (gr. G. Aitkens).
2. Col. Cornwallis-West, Ruthin Castle, Denbighshire (gr. H. Forder).

BB. 1. P. Yorke, Esq.
2. Col. Cornwallis-West.

Class 50.—Open only to Growers in the six northern Counties of England, and in the Isle of Man.

AA. 1. J. Brennand, Esq.
2. W. E. Hyde, Esq.

BB. 1. J. Brennand, Esq.
2. W. E. Hyde, Esq.

Class 51.—Open only to Growers in Scotland.

AA. 1. Col. Gordon, Threave, Castle Douglas (gr. J. Duff).
2. No award.

BB. No entry.

Class 52.—Open only to Growers in Ireland.

AA. 1. Earl of Bessborough, Bessborough, Piltown, Ireland (gr. T. E. Tomalin).
2. C. B. Broad, Esq., Aghern, Conna, Co. Cork.

BB. No entry.

Class 53.—Open only to Growers in the Channel Islands.

AA. No entry.

BB. No entry.

Division VI.

Single Dishes of Fruit grown entirely in the Open Air.

Six Fruits to a Dish.

Open to Gardeners and Amateurs only. Nurserymen and Market Growers excluded.

Prizes in each Class, except 80, 81, 92, 111, 149 and 150, as follows: 1st Prize, 7*s.*; 2nd Prize, 5*s.*

Choice Dessert Apples.

N.B.—The Judges are instructed to prefer Quality, Colour, and Finish to mere Size.

Class 54.—Adams' Pearmain.

1. Lord Hillingdon (gr. A. R. Allan).
2. T. W. Startup, Esq., West Farleigh, Maidstone.

Class 55.—Allington Pippin.

1. E. G. Mocatta, Esq., Woburn Place, Addlestone, Surrey (gr. T. Stevenson).
2. Duke of Richmond.

Class 56.—American Mother.

1. Lord Hillingdon (gr. A. R. Allan).
2. C. A. Morris-Field, Esq., Beechy Lees, Sevenoaks (gr. R. Edwards).

Class 57.—Ballinora Pippin.

1. Lord Hillingdon (gr. J. Shelton).
2. No award.

Class 58.—Belle de Boskoop.

1. J. Walter, Esq., Bearwood, Wokingham (gr. W. Barnes).
2. T. W. Startup, Esq.

Class 59.—Ben's Red.

1. W. E. S. E. Drax, Esq.
2. Rev. H. A. Bull.

Class 60.—Blenheim Orange.

1. Rev. H. A. Bull.
2. H. St. Maur, Esq.

Class 61.—Charles Ross.

1. G. Crayden, Esq., Albany Street, Sittingbourne.
2. C. A. Morris-Field, Esq.

Class 62.—Christmas Pearmain.
1. Duke of Richmond.
2. W. E. S. E. Drax, Esq.

Class 63.—Claygate Pearmain.
1. C. A. Morris-Field, Esq.
2. Lord Foley, Ruxley Lodge, Claygate, Surrey (gr. H. C. Gardner).

Class 64.—Coronation.
1. Duke of Richmond.
2. C. B. Broad, Esq.

Class 65.—Cox's Orange.
1. D. Best, Esq.
2. H. B. Davies, Esq., Myrtle Cottage, Ashford, Middlesex.

Class 66.—Duke of Devonshire.
1. W. A. Voss, Esq.
2. Col. Petre.

Class 67.—Egremont Russet.
1. W. E. S. E. Drax, Esq.
2. J. Speer, Esq., 4 Belmont, Swanley Junction, Kent.

Class 68.—Fearn's Pippin.
1. J. Walter, Esq.
2. H. G. Kleinwort, Esq., Wierton Place, Maidstone (gr. B. J. Mercer).

Class 69.—Golden Reinette.
No award.

Class 70.—Houblon.
1. H. St. Maur, Esq.
2. No award.

Class 71.—James Grieve.
1. Lord Howard de Walden.
2. W. E. S. E. Drax, Esq.

Class 72.—King of Tompkins County.
1. Lord Howard de Walden.
2. Mr. A. Smith, The Convent Gardens, Roehampton Lane, S.W.

Class 73.—Lord Hindlip.
1. No award.
2. Dr. T. Jackson, Brigstock Road, Thornton Heath (gr. W. Paulley).

Class 74.—Margil.
1. Lord Hillingdon (gr. J. Shelton).
2. Lord Hillingdon (gr. A. R. Allan).

Class 75.—Ribston Pippin.

1. Lord Hillingdon (gr. A. R. Allan).
2. Lord Howard de Walden.

Class 76.—Rival.

1. Duke of Richmond.
2. C. B. Broad, Esq.

Class 77.—Scarlet Nonpareil.

1. No award.
2. J. T. Charlesworth, Esq., Nutfield Court, Surrey (gr. T. W. Herbert).

Class 78.—St. Edmund's Pippin.

1. F. Lansdell, Esq., Desford Ind. School, Leicester.
2. J. B. Fortescue, Esq.

Class 79.—Wealthy.

1. C. O. Walter, Esq., Ickleton House, Wantage.
2. Sir C. E. Hamilton, Bart.

Class 80.*—Eight fruits of any other variety, not included above, fit for use.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. Lord Hillingdon (gr. A. R. Allan). 'King of the Pippins.'
2. D. Best, Esq. 'Worcester Pearmain.'
3. W. W. Mann, Esq., Ravenswood, Bexley (gr. J. Simon). 'King of the Pippins.'
4. Mr. A. Smith. 'Jefferson.'

Class 81.*—Eight fruits of any other variety, not included above, later.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. J. Walter, Esq. 'Cornish Gilliflower.'
2. Lord Hillingdon (gr. A. R. Allan). 'McIndoe's Russet.'
3. W. A. Voss, Esq. 'Scarlet Pearmain.'
4. Mr. A. Smith. 'Baumann's Winter Reinette.'

* An Exhibitor may enter only one variety in Classes 80 and 81, in which Classes eight Fruits must be shown to a dish for the Judges to be able to taste two of them; the name of the variety must be given on the Entry Form.

Choice Cooking Apples.

N.B.—The Judges are instructed to prefer Quality and Size to mere Colour.

Class 82.—Annie Elizabeth.

1. B. Henderson, Esq., Epping House, Little Berkhamsted (gr. H. Smith).
2. W. E. S. E. Drax, Esq.

Class 83.—Beauty of Kent.

1. G. Lubbock, Esq., Broadoaks, Byfleet, Surrey (gr. J. B. Lowe).
2. Col. C. Harbord, Gunton Park, Norwich (gr. W. Allan).

Class 84.—Bismarck.

1. D. Best, Esq.
2. H. St. Maur, Esq.

Class 85.—Bramley's Seedling.

1. Earl Stanhope, Chevening Park, Sevenoaks (gr. J. C. Sutton).
2. D. Best, Esq.

Class 86.—Byford Wonder.

1. C. A. Morris-Field, Esq.
2. J. Lee, Esq.

Class 87.—Dumelow's Seedling, *syn.* Wellington, and Normanton Wonder.

1. Mr. A. Smith.
2. G. Lubbock, Esq.

Class 88.—Ecklinville.

1. E. G. Mocatta, Esq.
2. J. T. Charlesworth, Esq.

Class 89.—Edward VII.

1. F. Lansdell, Esq.
2. No award.

Class 90.—Emneth Early, *syn.* Early Victoria.

No entry.

Class 91.—Emperor Alexander.

1. J. T. Charlesworth, Esq.
2. B. H. Henderson, Esq.

Class 92.—Encore.

First Prize, 20*s.*; Second, 17*s.* 6*d.*; Third, 15*s.*; Fourth, 12*s.* 6*d.*; Fifth, 10*s.*; Sixth, 7*s.* 6*d.*; Seventh, 5*s.*

Prizes presented to the Society by Messrs. Joseph Cheal, Crawley.

1. R. M. Whiting, Esq., Crendenhill, Hereford.

No other awards.

Class 93.—Gascoyne's Scarlet.

1. W. E. S. E. Drax, Esq.
2. E. G. Mocatta, Esq.

Class 94.—Golden Noble.

1. Dr. T. Jackson.
2. F. J. B. Wingfield-Digby, Esq.

Class 95.—Grenadier.

1. J. B. Fortescue, Esq.
2. C. B. Broad, Esq.

Class 96.—Hambling's Seedling.
1. H. St. Maur, Esq.
2. Earl Stanhope.

Class 97.—Lady Henniker.
1. Duke of Richmond.
2. J. B. Fortescue, Esq.

Class 98.—Lane's Prince Albert.
1. D. Best, Esq.
2. Duke of Richmond.

Class 99.—Lord Derby.
1. D. Best, Esq.
2. T. W. Startup, Esq.

Class 100.—Mère de Ménage.
1. Col. Petre.
2. Mrs. M. Knox, Holt Hatch, Alton, Hants (gr. W. West).

Class 101.—Newton Wonder.
1. J. Walter, Esq.
2. F. Lansdell, Esq.

Class 102.—Norfolk Beauty.
1. Col. C. Harbord.
2. C. B. Broad, Esq.

Class 103.—Peasgood's Nonsuch.
1. H. B. Davies, Esq.
2. D. Best, Esq.

Class 104.—Potts' Seedling.
1. F. J. B. Wingfield-Digby, Esq.
2. F. W. Platt, Esq., Ken View, View Road, Highgate, N.

Class 105.—Revd. W. Wilks.
No entry.

Class 106.—Royal Jubilee.
1. Duke of Richmond.
2. J. Lee, Esq.

Class 107.—Stirling Castle.
1. D. Best, Esq.
2. J. B. Fortescue, Esq.

Class 108.—The Queen.
1. W. A. Voss, Esq.
2. W. E. S. E. Drax, Esq.

Class 109.—Tower of Glamis.
1. Earl of Bessborough.
2. Earl Stanhope.

Class 110.—Warner's King.

1. D. Best, Esq.
2. E. G. Mocatta, Esq.

Class 111.—Eight fruits of any other variety not included above.

Four Prizes: 7*s*., 6*s*., 5*s*., 4*s*.

An Exhibitor may enter only one variety in Class 111, in which Class eight Fruits must be shown to a dish for the Judges to be able to taste two of them; the name of the variety must be given on the Entry Form.

1. Mr. A. Smith. 'Tyler's Kernel.'
2. Duke of Richmond. 'Mrs. Barron.'
3. C. O. Walter, Esq. 'Toddington.'
4. Rev. H. A. Bull. 'Withington Fillbasket.'

Choice Dessert Pears.

Class 112.—Beurré Alexander Lucas.

1. F. J. B. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 113.—Beurré d'Amanlis.

1. Rev. H. A. Bull.
2. G. Miller, Esq.

Class 114.—Beurré d'Anjou.

1. J. B. Fortescue, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 115.—Beurré d'Avalon (*syn*. Porch's Beurré and Glastonbury).

No award.

Class 116.—Beurré Bosc.

1. Lord Howard de Walden.
2. F. Bibby, Esq.

Class 117.—Beurré de Naghan.

No entry.

Class 118.—Beurré Dumont.

1. Lord Hillingdon (gr. J. Shelton).
2. Lord Hillingdon (gr. A. R. Allan).

Class 119.—Beurré Hardy.

1. Lord Hillingdon (gr. A. R. Allan).
2. Rev. H. A. Bull.

Class 120.—Beurré Perran.

No entry.

Class 121.—Beurré Superfin.

1. C. H. Berners, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 122.—Blickling.
1. Col. C. Harbord.
2. No award.

Class 123.—Charles Ernest.
1. Duke of Portland.
2. C. H. Berners, Esq.

Class 124.—Comte de Lamy.
1. J. B. Fortescue, Esq.
2. Lord Hillingdon (gr. J. Shelton).

Class 125.—Conference.
1. Col. Petre.
2. R. F. Bristowe, Esq., Barton Mills, Mildenhall (gr. J. Reynolds).

Class 126.—Directeur Hardy.
1. Col. Petre.
2. F. Bibby, Esq.

Class 127.—Doyenné du Comice.
1. Col. Petre.
2. F. J. B. Wingfield-Digby, Esq.

Class 128.—Durondeau.
1. Col. Petre.
2. F. J. B. Wingfield-Digby, Esq.

Class 129.—Emile d'Heyst.
1. Col. C. Harbord.
2. R. F. Bristowe, Esq.

Class 130.—Fondante d'Automne.
1. Col. C. Harbord.
2. Lord Hillingdon (gr. J. Shelton).

Class 131.—Fondante de Thiriot.
1. C. H. Berners, Esq.
2. Duke of Richmond.

Class 132.—Glou Morceau.
1. Col. Petre.
2. R. F. Bristowe, Esq.

Class 133.—Joséphine de Malines.
1. F. J. B. Wingfield-Digby, Esq.
2. Duke of Portland.

Class 134.—Le Brun.
No entry.

Class 135.—Le Lectier.
1. Lord Howard de Walden.
2. Mrs. Bankes.

Class 136.—Louise Bonne of Jersey.
1. F. Bibby, Esq.
2. A. Benson, Esq.

Class 137.—Marguerite Marillat.
1. Col. Petre.
2. No award.

Class 138.—Marie Benoist.
1. F. J. B. Wingfield-Digby, Esq.
2. No award.

Class 139.—Marie Louise.
1. Col. Petre.
2. Col. C. Harbord.

Class 140.—Nouvelle Fulvie.
1. Mrs. Bankes.
2. Col. Petre.

Class 141.—Olivier des Serres.
1. F. J. B. Wingfield-Digby, Esq.
2. Lord Hillingdon (gr. A. R. Allan).

Class 142.—Pitmaston Duchess.
1. H. G. Kleinwort, Esq.
2. Lord Hillingdon (gr. A. R. Allan).

Class 143.—President Barabé.
1. Col. C. Harbord.
2. F. J. B. Wingfield-Digby, Esq.

Class 144.—Santa Claus.
No entry.

Class 145.—Souvenir du Congrès.
No entry.

Class 146.—Thompson.
1. F. J. B. Wingfield-Digby, Esq.
2. Lord Hillingdon (gr. A. R. Allan).

Class 147.—Triomphe de Vienne.
1. Lord Hillingdon (gr. A. R. Allan).
2. W. E. S. E. Drax, Esq.

Class 148.—Winter Nelis.
1. R. F. Bristowe, Esq.
2. Lord Foley.

Class 149.*—Eight fruits of any other early variety not included above.

Four Prizes: 7*s.*, 6*s.*, 5*s.*, 4*s.*

1. W. A. Voss, Esq. 'Doyenné Boussoch.'
2. Lord Foley. 'Fondante de Cuerne.'
3. F. Bibby, Esq. 'Marie Louise d'Uccle.'
4. No award.

Class 150.*—Eight fruits of any other late variety not included above.

Four Prizes: 7*s.*, 6*s.*, 5*s.*, 4*s.*

1. F. J. B. Wingfield-Digby, Esq. 'Easter Beurré.'
2. Mrs. Bankes. 'Beurré Diel.'
3. Lord Foley. 'Beurré Rance.'
4. F. Bibby, Esq. 'Beurré Rance.'

*** An Exhibitor may enter only one variety in Classes 149 and 150, in which Classes eight Fruits must be shown to a dish for the Judges to be able to taste two of them; the name of the variety must be given on the Entry Form.**

Fruit Competition for Affiliated Societies.

Six Dishes, distinct, Cooking Apples; Six Dishes, distinct, Dessert Apples; Six Dishes, distinct, Dessert Pears. It is stipulated that no two Societies may combine, and that each Society competing collect all the specimens shown from amongst their own members only and not from outside. Eight days' notice must be given of intention to compete. The Cup may be won only once in four years by any one Society; but the Winners may compete for any other prizes offered in this Class.

First, Challenge Cup to be held for 12 *months, and Silver Gilt Knightian Medal. Second, Silver Gilt Banksian Medal.*

The Society winning the Cup will be required to enter into an agreement, signed by its President, Treasurer, and Secretary, to return the Cup in good condition, or failing this, to undertake, both corporately or separately, to refund to the R.H.S. the sum of £20.

1. East Anglian Horticultural Society. Sec.: W. L. Wallis, 12 Royal Arcade, Norwich.
2. Colchester and District Gardeners' Association. Sec.: W. H. Tanner, 43 East Street, Colchester.

REPORT ON THE ANNUAL CONFERENCE OF AFFILIATED SOCIETIES AND SOCIETIES IN UNION.

October 14, 1910.

The Annual Conference of Affiliated Societies was held on October 14 at the Royal Horticultural Hall, Sir Albert Rollit, D.C.L., LL.D., Litt.D., in the Chair.

Opening the Conference the Chairman said:—

I greet you as delegates of our three hundred Affiliated Societies, at home and in the Colonies, with a hearty welcome, and convey

to you the assurances of the Council of the great interest they take in your work, and of their readiness to do whatever lies in their power to promote the welfare of your Societies at all times. Your Societies are a powerful factor in the gardening world, and the Council recognize this. As the Parent Society the Royal Horticultural Society seeks to make your work more complete, more organized, and easier to carry on. As an instance of this, the Council has recently instituted a "Certificate of Recognition of Diligent Interest in Plants," to be awarded to children through the Affiliated Societies in the juvenile classes at their local exhibitions. There is nothing like taking hold of the mind at an early stage if it is to be moulded in any particular direction. "'Tis education forms the common mind; just as the twig is bent, the tree's inclined." And so the Council desires through you to encourage children to take a practical interest in plants, thus helping to advance one common cause, namely, practical gardening and the love of plant life.

The advantages offered by the R.H.S. to your Societies are many. By our Exhibitions; by our garden at Wisley, with its teaching and students, its trials and experiments; and by our publications, we seek to influence horticulturally the towns and villages where you are endeavouring to further the work; and in this localization of effort your services are of the greatest value, and assist, as it were, to focus the influences we radiate. Through you theoretical, scientific, and practical horticultural knowledge can be spread among large classes of the people, and we afford your Societies special means for these useful purposes. For instance, you can be assured of really capable Lecturers by applying to any of those gentlemen on the official list, containing some three hundred names, furnished by the Society and specially drawn up for your use. Again, prepared and most excellent Lectures, with lantern slides, can be had from our Vincent Square offices at Westminster, and any of your own members at all accustomed, or even learning, to read before an audience, may deliver them at your meetings. Then you possess some privileges as to admission to the Fortnightly Shows at Vincent Square and to those greater, but not more useful or educational, Exhibitions at the Temple and Summer Shows—the site chosen for the latter next year being Olympia.

Then the much-valued Journal and Proceedings of the Society are issued to your Libraries for the information of your members. As you know, each volume contains a wealth of horticultural matter, gathered in from the wide world, and comprising all the most up-to-date facts worth recording. This Journal is a work highly creditable to the Society, and should be most useful to your members.

Medals, and Certificates of Commendation, are also obtainable from Vincent Square, and as people appreciate the recognition of hard work and success by such awards, these medals and certificates should, if wisely bestowed, provide great and real stimulus to horticultural work.

These Annual Conferences also afford you the opportunity of interchange of ideas with the members representing the Mutual

Improvement Societies in union, and may lead to the evolution of new ideas. And may I say just a word in favour of Mutual Improvement Societies? Everyone seems able to help to improve others, and my early experience of such societies at my native city of Hull—where, as Mayor, I opened the first Chrysanthemum Show and where I was for many years Chairman of the Botanic Gardens—convinced me of their great value in the training of young men, and I was proud to preside at their Jubilee Meeting at Hull in 1907.

The Challenge Cup offered at to-day's Show, for the second time, for Apples and Pears shown by Affiliated Societies, has been won by the East Anglian Society, while the Colchester Gardeners' Association secured the second prize. The Cup has been won with very few entries, only four exhibits having been staged, as compared with thirteen last year. The entries ought to be on the ascending, not on the descending, scale, and I can only hope that the reduction in numbers is due to some exceptional cause—perhaps the bad season—and does not indicate any decline of interest. I urge you to make more entries next year, though, if it should again so happen that there are but few, the greater the chance for those entering of gaining the Cup.

Sir Albert Rollit then spoke on the first subject on the Agenda, viz. the International Horticultural Exhibition to be held in the grounds of Chelsea Hospital from May 22 to 30, 1912—in all, eight clear working days. It had been hoped that the Honorary Secretary of the Exhibition—Mr. Edward White, of 7 Victoria Street, Westminster—would be present to speak on this subject, but illness prevented his attendance.

The Chairman added that the most favourable site offered in London had been procured, after considerable search. The Chelsea Hospital gardens and grounds were not as large as could have been desired, but there were about 16½ acres, and the site had much, in arrangement and planting, to commend it. It was there that the great Naval Exhibition was held some years ago, and the place is almost perfectly adapted to the object now proposed, namely, a Great Flower Show. The organization was already rapidly advancing. It should, however, be fully understood that the Exhibition was not being directly organized by the R.H.S., but by a separate body of gentlemen, who had taken this National, or rather International, project in hand. But, although the Exhibition was thus quite detached, both in organization and responsibility, from the Royal Horticultural Society, the Council had taken care to arrange that special facilities for admission should be available for all its Affiliated Societies, full particulars of which would be published in due course. Such an International Exhibition had not been held since 1866, and the many recent similar movements and international courtesies on the Continent and in the United States of America seemed to point out plainly that the time had arrived when England should make some return for the hospitalities exercised abroad. Whatever else might be said of her, England was foremost in the

horticultural world. The R.H.S. would not be behindhand in sympathy with, and in working for and furthering the interests of, this great undertaking, and the powerful horticultural trades were already busy giving publicity and preparing exhibits for it. The Affiliated Societies could do an invaluable service by making the Exhibition known in their various localities and by creating an interest amongst their members and the people in general. This might be done by means of discussions at their meetings, references in their local Press, and by lectures; and Mr. Edward White would be glad both to provide them with information and to receive from them suitable suggestions. It is therefore hoped that those present will return to their own local Societies as emissaries from this conference to carry the call to active effort, and so to play their part in what will be an epoch-making event in the history of British horticulture.

The Chairman then asked for his remarks to be supplemented by the reading of the following letter from Mr. White, the Secretary of the International Exhibition:—

Westminster Chambers, 7 Victoria Street, London, S.W.:
October 14, 1910.

Dear Fellow-Secretaries,—I am terribly disappointed that on account of illness I cannot attend the meeting and tell the delegates of the Affiliated Societies all there is to say about the 1912 Exhibition.

There is no body of gentlemen whom I should meet with more pleasure in connexion with the matter, but in my enforced absence I will endeavour to give a simple record of our doings up to date as well as I can from memory.

Their Majesties the King and Queen are most hopeful of being able to open the Exhibition, but cannot, of course, actually pledge themselves to the date so long beforehand.

The King and Queen and practically all the Royal Family are patrons.

Most of the influential people of the country have agreed to become vice-presidents, but we are sure to have missed some good names, and I should like any suggestions.

About one hundred and fifty gentlemen, representing Horticulture generally, have agreed to act on the General Committee. Some further invitations, however, have yet to be sent out, and I am afraid we may have missed some people who ought to be on the list.

The list of English county representatives or secretaries of Territorial Committees is nearly complete. These gentlemen have been invited to form local Committees. Mr. J. W. McHattie and another, acting as representatives of Scotland, have promised to organize Scottish Committees; Mr. Moore, Irish; and Mr. Maclaren and Mr. Pettigrew, Welsh Committees; and I hope that people living at a distance from London will recognize in the formation of the County Committees a proof of the desire of the Executive Committee to give every part of the country the right to feel it is actually taking part in the management of the Exhibition.

All the official representatives of the different Colonies have accepted invitations to serve on a list which I think we ought to call an "Empire" "list of honour."

In this list are included the names of many gentlemen which have been furnished by the Agents-General as representative horticulturists in their various Colonies.

A very full list of names has been placed upon a Foreign list of honour, all invitations having been accepted with great cordiality. There is already very keen interest in the Exhibition among Continental horticulturists, and we shall without doubt have a record number of visitors from abroad.

For administrative purposes and to comply with the existing laws on the subject, it has not been found possible to avoid making the Exhibition a limited liability company of which the members of the Executive are compulsory shareholders.

The Sub-Committees already appointed are: (1) Finance; (2) Schedule; (3) Reception; (4) Show and Site. I may group a few general remarks under these heads.

Finance.—It has been decided that any surplus funds shall be devoted to scientific, charitable, or educational purposes to be determined hereafter.

The first consideration, of course, is the establishment of an adequate Guarantee Fund. The R.H.S. has generously started the ball with a guarantee of £4,000 under certain conditions, in addition to subscribing £1,000 towards preliminary expenses.

Several donations and large guarantees have already been promised, and matters are now nearly ready for making a systematic appeal to the public.

I hope we may soon be able to prepare an estimate giving some idea of the expenses for the Exhibition. I may remind you that the expenses of the 1866 Exhibition were about £12,500 and the profits were nearly £3,500.

Sir Jeremiah Colman has kindly undertaken the heavy and responsible work of the Hon. Treasurership.

Schedule Committee.—The preliminary Schedule is on the point of completion by the Sub-Committee, but it has yet to be submitted to the Executive Committee before it can be printed. The limitations of ground-space impose great difficulties on the Executive.

A phrase in everybody's mouth is the hope that the Exhibition will not be merely a "glorified Temple show." You will be able to give an assurance that so far as lies in the power of the Executive, it is intended to hold a *real International Horticultural Exhibition.*

Site and Show Committee.—The Executive Committee has settled on Chelsea Hospital Gardens for the site. This would be perfect if it were only a little larger. The open space available is about 16½ acres, and there are in addition about 4 acres of trees and shrubs, which will make a fine background for exhibits. The area of the 1866 site was only 4 to 5 acres.

The Exhibition is to be open from May 22 to May 30, 1912.

Reception Committee.—No definite programme has been discussed, but it is hoped that a series of entertainments worthy of the occasion will be organized. The Committee is considering the question of engaging the premises of the R.H.S. for the period of the Exhibition in this connexion.

A meeting of the General Committee will be held on October 25 at the Hotel Windsor, to consider among other things the question of holding a scientific and educational conference. Many people are anxious that one should be held. The Executive Committee is quite favourable to the proposal, provided a worthy programme can be prepared, and suitable premises secured.

A meeting of the County Representatives is also to take place on October 25.

I hope to get the Committee to approve the holding of an Exhibition of Garden Paintings in the Royal Horticultural Hall. I should also like to have a really comprehensive Entomological Exhibition held there if possible.

Mr. John Hassall has been asked to design an advertisement poster, which will be reduced to stamp size for correspondence purposes.

The leading Nurserymen have kindly inserted advertisement slips in their catalogues; nearly half a million have already been sent out.

A meeting of Press representatives was called to invite them to form a Press Committee, but they decided that it would suffice if one of their number was made Press Secretary. Mr. R. H. Pearson was therefore appointed.

Believe me,

Yours very truly,

EDWARD WHITE.

Discussion followed.

It was proposed by Mr. Boshier, of Croydon, seconded by Mr. Baskett, of Egham, and carried with enthusiasm, that "This meeting heartily endorses the proposal to hold an International Exhibition in 1912, and will do its very utmost to give it publicity and support."

A promise was given to communicate to Mr. White the desire of the Conference that a schedule and full particulars of the Exhibition should be sent to the Secretary of each Affiliated Society as soon as possible.

The Secretary of the R.H.S. urged that any suggestions Affiliated Societies might wish to make to the Exhibition Committee should have due reference to the limited space of the site, and to the fact that, as an "International," the Exhibition could only be formulated on very broad general lines which would unavoidably exclude from the schedule some of the features peculiar to local and even national Shows. Moreover, there would be no room for anything in the nature of side shows. The Schedule Committee would rightly be blamed if they included classes for exhibits for which later on they found they had no possible space available.

Appointment at the R.H.S. Gardens.—A resolution was carried that "The meeting recommended to the Council of the R.H.S. the consideration of the following subject, viz.: 'Would the Council of the R.H.S. provide for the sons of members of Affiliated Societies by allowing them to fill vacancies occurring at Wisley for periods of two years, at an entrance fee less than that paid by ordinary students? Appointment to be according to merit, as shown by an entrance examination. A nominal wage to be given to each man, and a certificate of efficiency on the termination of the two years if his conduct and progress shall have been satisfactory. Three years' apprenticeship in an approved garden to have been spent prior to admission.'"

[NOTE.—At a meeting of the Council held on October 25, this recommendation was considered, and minuted as follows:—"A report was brought up on the recent Conference of Affiliated Societies, together with its proposal concerning apprenticeships for the sons of members of such societies. The Council ordered a reply to be made to the effect that they would always be happy to consider favourably any particular case submitted to them on its merits, but could make no absolute promise, as vacancies among the paid employés in the gardens were very rare; and as regarded the admission simply of students, the Council did not think it possible to fix any less fee than £5 to cover two years' scientific and practical instruction."]

Amateur Gardeners.—The definition of an amateur gardener again came under discussion. The rule of the R.H.S. was read. The Rev. W. Wilks said that the definition might possibly be more simplified thus:—

> By the word "amateur" is understood a person who maintains a garden with a view to his own use and enjoyment, and not for the purpose of gaining a livelihood. The fact of his disposing of surplus produce for money does not change him into a tradesman unless the whole maintenance of the garden is intended to return him an annual profit.
>
> By the word "nurseryman" is understood a person who maintains a garden for the purpose of gaining a livelihood and intends it to return him an annual profit.

Either rule indicates the broad principle of differentiation between an amateur and a nurseryman; but the real difficulty of local societies is not that they want to distinguish between amateurs and trade growers, but that they want to split up amateurs into classes and cannot agree on exactly what classes they want. However, it is perfectly easy for any society to amplify the above definitions in such a way as would satisfactorily meet any local difficulty or condition, by creating divisions or classes for amateurs employing *no* help, or employing one, two, three, or more men in their garden; but it is quite hopeless to attempt any definition of a "professional" gardener, save the very obvious one that

he is a man who "earns his living by gardening," as does every jobbing gardener from John o' Groat's to Land's End.

A vote of thanks to the Chairman was proposed and carried with acclamation, after which the proceedings of the Conference closed.

DEPUTATION TO THE FOUR NORTHERN COUNTIES' FRUIT CONGRESS AND SHOW,

Held at Hexham, October 20-22, 1910.

A deputation (Messrs. Geo. Bunyard, V.M.H., Jas. Hudson, V.M.H., and A. H. Pearson, J.P., V.M.H.) was appointed by the Council to attend the Congress. It was the first of its kind held in the district, and ample proof was afforded of the practical interest taken in fruit cultivation in the North of England.

The deputation reports most favourably on the success of the Congress (in great measure due to the exertions of the energetic Secretary, the Rev. J. Bernard Hall, B.A., R.N.) and on the general excellence of the Show.

There were three complimentary exhibits from growers in the South and West, as will be seen by the list of awards. Of those within the sphere of influence (the Northern Counties) there were several exhibitors who did not compete in the set classes, but who are already well known as skilled cultivators. But it was not these, so much as those whose names were comparatively unknown to more Southern growers, who gave the impression of Northern excellence in fruit-growing. In almost all instances the exhibits, both Apples and Pears, were staged remarkably well, and from them an idea could be formed of the best varieties for the district.

In the competitive classes the contest was keen and close in nearly every case, both in the "open" and the "amateur" sections. There was a marked indication of hardiness in all the fruits staged by the Northern growers. Colour, it is true, was not conspicuous, but the fruits were remarkably firm and weighty for their respective varieties. The best varieties of Apples were 'Ecklinville,' 'Lord Suffield,' 'Lord Derby,' 'Lane's Prince Albert,' 'Newton Wonder,' 'Bramley's Seedling,' 'Allington Pippin,' 'King of the Pippins,' and 'Worcester Pearmain'; of Pears, 'Marie Louise,' 'Beurre Diel,' 'Pitmaston Duchess,' 'Durondeau,' 'Beurré Superfin,' and 'Hacon's Incomparable.'

In the competition in the classes for bottled fruits there were many good examples of the fruit preserver's handicraft and skill.

It should be borne in mind that the altitude of the district, and its topographical position, with the consequent exposure to winds and sudden changes of temperature, limit the number of varieties of both Apples and Pears that can be successfully grown, more so undoubtedly

than is the case across the border in the Southern and Western Counties of Scotland.

The Congress was held on each of the three days of the exhibition, when several valuable papers were read by acknowledged experts in fruit culture, and a keen interest was evidently taken in them by those who were cultivators either for home consumption or for market supplies. Demonstrations of spraying appliances were conducted on the second day in very inclement weather.

The Rev. J. Bernard Hall deserves every credit for his painstaking endeavours to render this new departure in Northern fruit-growing a success, and it succeeded admirably. During each day he was as indefatigable in his efforts for the furtherance of the Congress as he had previously been in the less exciting but even more necessary work of preparation for it.

The President and Council of the R.H.S. desire to record their thanks for the kind and ungrudging hospitality extended to the members of the deputation.

W. Wilks, *Secretary.*

Awards.

Silver-gilt Knightian Medal.

To King's Acre Nursery, Hereford, for collection of hardy fruits.
To Messrs. Bunyard, Maidstone, for collection of hardy fruits.

Silver Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for orchard house fruits.

Silver-gilt Banksian Medal.

To Messrs. Robson, Hexham, for fruit and shrubs.
To Messrs. Fairbairn, Carlisle, for flowers and decorations.
To Mr. J. Millican, Scotby, for hardy fruits.

Silver Knightian Medal.

To Messrs. W. Fell, Hexham, for fruit, &c.
To Messrs. Michie, Alnwick, for hardy fruits.
To the Cumberland and Westmorland C.C., for hardy fruits.
To Mr. Walter A. Voss, Rayleigh, for hardy fruits.

Silver Banksian Medal.

To Mr. Wm. Lawrenson, Newcastle, for fruit and flowers.
To Mrs. N. G. Clayton (gr. Mr. Cocker), Hexham, for Apples and Pears.
To Mr. W. A. Alexander, Hexham, for Apples.
To Chadwick Memorial Schools, for fruits, vegetables, and flowers.
To Messrs. Clark, Carlisle, for hardy fruits.
To the Hon. C. A. Parsons (gr. Mr. Dixon), Wylam, for Pears.

Bronze Banksian Medal.

To L. C. Salfield, Esq. (gr. Mr. Stewart), Dalston, for fruit.
To D. Richardson, Esq. (gr. Mr. Waugh), Stocksfield, for fruit.
To J. Harris, Esq., D.L., J.P. (gr. Mr. Fixter), Penrith, for fruit.
To Messrs. Porteous & Thomson, Hexham, for fruit.

GENERAL MEETING.

October 25, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair.

Fellows elected (31).—W. D. Ainger, H. Bradford, Miss E. Campbell, Mrs. R. Cohen, Mrs. Cross, Mrs. J. L. Densham, E. Fleming, Mrs. T. H. Fox, T. Francis, Mrs. N. Garrard, W. Hartmann, J.P., Miss F. A. Kent, C. C. Knight, S. Larkin, Major-General H. M. Lawson, C.B., S. Lebus, W. Lowe, Mrs. McClintock, G. McL. Marshall, T. H. Moore, Mrs. E. P. S. Reed, G. B. Scobell, G. Shepperson, Mrs. C. T. Sidgwick, T. J. Skelton, J. W. Taylor, J. E. Toyne, Mrs. Wilson, R. Wood, W. R. Wright, Mrs. Wyatt.

Fellow resident abroad (1).—J. A. Korthals (South Africa).

Associate (1).—V. Gregson.

Society affiliated (1).—Falmouth Spring Flower Show.

A lecture on "Life: A Director of Force in Development and Evolution," was given by the Rev. Prof. G. Henslow, M.A., F.L.S., V.M.H. (see p. 534).

EXHIBITION OF VEGETABLES.

Held in the Society's Hall, Vincent Square, S.W.
October 25, 1910.

THE JUDGES.

Bates, W., Cross Deep Gardens, Twickenham.
Davis, J., Glebelands Gardens, S. Woodford.
Dean, A., V.M.H., 62 Richmond Road, Kingston.
Divers, W. H., Belvoir Castle Gardens, Grantham
Fielder, C. R., V.M.H., North Mymms Park Gardens, Hatfield.
Fyfe, W., Lockinge Park Gardens, Wantage.
Hudson, J., V.M.H., Gunnersbury House Gardens, Acton, W.
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Poupart, W., Marsh Farm, Twickenham.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.

THE REFEREES.

Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Cheal, J., Lowfield Nurseries, Crawley.
Pope, W., Welford Park Gardens, Newbury, Berks.

OFFICIAL PRIZE LIST.

THIS EXHIBITION WAS OPEN TO AMATEURS ONLY.

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

Collections.

N.B.—A competitor can enter in only one of the first three Classes. Arrangement will be taken into consideration by the Judges.

Class 1.—12 kinds, distinct, to be selected from the following list. Number of specimens to be as stated. Beet, 9; Brussels Sprouts, 36 buttons; Cabbage, 3 heads; Couve Tronchuda, 3 specimens; Broccoli or Cauliflower, 6 heads; Carrots, 12; Savoy, 3 heads; Celery, 6 sticks; Cucumbers, 2; Endive, 6; Leeks, 12; Lettuce, 6; Mushrooms, 12; Onions, 12; Parsnips, 12; Peas, 36 pods; Potatos, 12; Tomatos, 12; Turnips, 12; Beans, Runner, 24 pods, or French, 36 pods.

First Prize, The Sutton Challenge Cup (value £21) and £10; Second, £5.

The winner will hold the Cup for one year subject to a guarantee of its return in good condition, or failing this to refund to the R.H.S. the sum of £25. The Exhibitor may win the Cup only once in four years, but may compete for Second Prize.

1. Hon. Vicary Gibbs, Aldenham House, Elstree (gr. E. Beckett).
2. H. T. Tatham, Esq., Kendall Hall, Elstree (gr. W. Gaiger).

Class 2.—9 kinds, distinct, to be selected from the list in Class 1. Number of specimens as there stated.

First Prize, £5; Second, £3; Third, £2.

1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
2. W. H. Myers, Esq., Swanmore Park, Bishops Waltham (gr. G. Ellwood).
3. Earl Spencer, Althorp Park, Northampton (gr. S. Cole).

Class 3.—6 kinds, distinct, to be selected from the list in Class 1. Number of specimens as there stated.

First Prize, £3; Second, £2 5*s*.

1. Marquis of Northampton, Castle Ashby, Northampton (gr. A. R. Searle).
2. No award.

Class 4.—Potatos, collection of 12 varieties, distinct, 12 tubers to a dish.

First Prize, £5; Second, £4.

1. Duke of Portland.
2. Countess Cowper, Panshanger, Hertford (gr. R. Staward).

Class 5.—Potatos, collection of 6 varieties, distinct, 12 tubers to a dish.

First Prize, £2 10*s.*; Second, £2.

Competitors in Class 4 cannot enter in 5.

1. Mrs. Denison, Little Gaddesden, Berkhamsted (gr. A. G. Gentle).
2. No award.

Class 6.—Onions, collection of 6 varieties, distinct, 12 bulbs to a dish.

First Prize, £3; Second, £2 5*s.*

N.B.—It is imperative that each dish be of a distinct type or character, *e.g.* two strains of 'Ailsa Craig' or two dishes of varieties indistinguishable from 'Ailsa Craig' will disqualify.

1. Duke of Portland.
2. W. H. Myers, Esq.

Class 7.—Salads, collection of 9 kinds, distinct, to be staged similarly to vegetables.

First Prize, £3 10*s.*; Second, £2 10*s.*

1. Hon. Vicary Gibbs.
2. H. T. Tatham, Esq.

Class 8.—Salads, collection of 6 distinct kinds, to be staged similarly to vegetables.

First Prize, £2 5*s.*; Second, £1 15*s.*

Competitors in Class 7 cannot enter in Class 8.

1. Duke of Portland.
2. W. H. Myers, Esq.

Class 9.—Other Vegetables, 6 kinds distinct, to be selected from the following:—Cardoons, 3; Capsicum or Chili, 24; Celeriac, 12; Pumpkin, 1; Stachys tuberifera, 50; Seakale, 12; Egg Plant, 12; Dioscorea Batatas, 3; Jerusalem Artichokes, 12; Asparagus, 36; Salsify, 12; Scorzonera, 12; Kohl Rabi, 12.

First Prize, £3; Second, £2.

1. Hon. Vicary Gibbs.
2. No award.

Single Dish Classes.

In Classes 10-41 the First Prize is in each case 10*s.*, and the Second 7*s.* 6*d.* The specimens shown in each Class must be always of one and the same variety.

Class 10.—Beans, Scarlet Runners, 24 pods.

1. Duke of Portland.
2. Marquis of Northampton.

Class 11.—Beans, French Climbers, 36 pods.

1. Duke of Portland.
2. Marquis of Northampton.

Class 12.—Beans, French Dwarf, 36 pods.
1. Duke of Portland.
2. Marquis of Northampton.

Class 13.—Beet, any one type, 9.
1. Mrs. Denison.
2. Duke of Portland.

Class 14.—Brussels Sprouts, 36 buttons.
1. Hon. Vicary Gibbs.
2. E. J. Preston, Esq., Kelsey Park, Beckenham (gr. M. Webster).

Class 15.—Brussels Sprouts, 3 plants.
1. Hon. Vicary Gibbs.
2. E. J. Preston, Esq.

Class 16.—Cabbage, 3.
1. Lord Foley, Ruxley Lodge, Claygate (gr. H. C. Gardner).
2. Earl Spencer.

Class 17.—Cabbage, Savoy, 3.
1. Duke of Portland.
2. E. J. Preston, Esq.

Class 18.—Cauliflower or Broccoli, 6.
1. Hon. Vicary Gibbs.
2. Duke of Portland.

Class 19.—Celery, White, 6.
1. Hon. Vicary Gibbs.
2. Earl Spencer.

Class 20.—Celery, Red, 6.
1. Hon. Vicary Gibbs.
2. Earl Spencer.

Class 21.—Cucumbers, 2.
1. Hon. Vicary Gibbs
2. Duke of Portland.

Class 22.—Leeks, 12.
1. Duke of Portland.
2. Countess Cowper.

Class 23.—Marrows, 3.
1. Lord Foley.
2. Countess Cowper.

Class 24.—Mushrooms, 12.
1. Mrs. Denison.
2. Hon. Vicary Gibbs.

Class 25.—Onions, Round or Globular, 12.
1. Mrs. Denison.
2. W. H. Myers, Esq.

Class 26.—Onions, Flat, 12.
1. Countess Cowper.
2. No award.

Class 27.—Parsnips, 12.
1. Earl Spencer.
2. Duke of Portland.

Class 28.—Carrots, Long, 12.
1. Duke of Portland.
2. Earl Spencer.

Class 29.—Carrots, Stump-rooted or Short, 12.
1. Hon. Vicary Gibbs.
2. Earl Spencer.

Class 30.—Peas, 36 pods.
1. Duke of Portland.
2. Hon. Vicary Gibbs.

Class 31.—Turnips, White, Skin and Flesh, 12.
1. Duke of Portland.
2. Mrs. Denison.

Class 32.—Turnips, Parti-coloured, 12.
1. Duke of Portland.
2. Hon. Vicary Gibbs.

Class 33.—Turnips, Yellow Flesh, 12.
1. Hon. Vicary Gibbs.
2. Mrs. Denison.

Class 34.—Potatos, White, 12.
1. Duke of Portland.
2. Earl Spencer.

Class 35.—Potatos, Coloured, 12.
1. Duke of Portland.
2. Mrs. Denison.

Class 36.—Kale, Dwarf, 3 plants.
1. Duke of Portland.
2. E. J. Preston, Esq.

Class 37.—Kale, Tall, 3 plants.
1. Duke of Portland.
2. Countess Cowper.

Class 38.—Tomatos, Red, 12.
1. Duke of Portland.
2. Hon. Vicary Gibbs.

Class 39.—Tomatoes, Yellow, 12.

1. Hon. Vicary Gibbs.
2. Duke of Portland.

Class 40.—Tomatos, Ornamental, 3 clusters.

No award.

Class 41.—Any other Vegetable not named in the Schedule.

1. Duke of Portland.
2. Hon. Vicary Gibbs.

Champion Challenge Cup.

The Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole Exhibition, the winner in Class 1 being excluded. An Exhibitor may win this cup only once in four years. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows:—

Classes 2, 4	...	...	...	...	9 Points each.
Classes 3, 7	...	...	...	...	6 ,, ,,
Classes 5, 6, 8, 9	...	...	...	...	4 ,, ,,
All other Classes	...	...	...	...	1 Point ,,

In case of an equality (and only in that case) Second Prizes will be added, in order to arrive at a decision, each Second Prize counting half the points allotted to the First Prize.

Duke of Portland ... ... 41 points.

GENERAL MEETING.

November 8, 1910.

Mr. George Bunyard, V.M.H., in the Chair.

Fellows elected (38).—Mrs. J. M. Binnie, Miss G. Bristow, G. H. Capron, the Countess of Clanwilliam, J. Comber, W. T. Coventon, E. A. Croft, Miss Crookshank, Mrs. F. de Chaumont, La Marquise d'Hautpoul, S. J. Elliott, Mrs. J. Fielden, S. W. Flory, W. St. J. Fox, N. M. Harrisson, F. W. Harvey, Mrs. Le Gros, J. M. McCaig, M.A., Mrs. G. M. McCombie, Mrs. R. McLaren, D. McMillan, Mrs. A. C. Marshall, Mrs. M. T. Martin, Mrs. H. Narracott, Miss M. Nicholls, F. G. Painter, Mrs. E. G. Raphael, S. Schilizzi, Mrs. V. Schuster, W. Shrives, Miss L. M. Smith, Percy Smith, Mrs. H. A. Steward, Miss M. Strudwick, T. Titley, R. F. Wells, Basil White, G. F. Zimmer.

Fellows resident abroad (2).—Comte Joseph de Hemptinne (Belgium), Isvar C. Guha (India).

Associate (1).—P. S. Finnerty.

A lecture on "Observations on the Blossoming of our Hardy Cultivated Fruits" was given by Mr. Cecil H. Hooper (see p. 548).

GENERAL MEETING.

November 22, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair.

Fellows elected (22).—E. H. Arnott, Miss C. Baumgartner, Miss Alice G. Bickham, Miss Helen C. Bickham, Hon. Mrs. Claud Biddulph, R. H. Chubb, Mrs. Crofton, Miss A. Davison, Mrs. A. T. Fox, G. E. Fridlington, T. Gordon, H. W. Gunston, W. U. Hill, Mrs. Low, T. B. Mathieson, E. Poulter, R. L. Reuss, J. E. Simms, W. Stark, the Duchess of Sutherland, Mrs. H. Watson, H. Wilding.

Fellows resident abroad (2).—John Hughes (West Africa), Alfred O. Jensen (Brussels).

Associate (1).—M. Fatehudden.

A lecture on "Plants in Congenial Positions" was given by Mr. James Hudson, V.M.H. (see p. 539).

FOURTEENTH EXHIBITION OF COLONIAL-GROWN FRUITS.

December 1-3, 1910.

The Show of Colonial-grown Fruit, held in the Hall on December 1 to 3, 1910, was an advance on any of its predecessors. The season of the year brought the hardy fruits of Canada—especially of British Columbia—together with a very fine exhibit of Citrus fruits from the West Indies. The magnificent arrangement of the British Columbia exhibit, comprising some 22 tons of fruit, was by far the most noticeable feature, the brilliantly coloured apples being raised tier upon tier to a height of 20 feet from the floor, and occupying almost a third of the Hall. There was an excellent attendance of Fellows and of the public each day, indicating the increasing appreciation of these shows and their practical usefulness.

A programme of lectures and demonstrations had been arranged, including "Cider-making," by Mr. B. T. P. Barker, M.A., and Mr. J. Ettle; "Methods of Fruit-growing in the Colonies," by Mr. Henry Hooper; "The Life of a Fruit Farmer in East Kootenay," by Mr. Tormay; "The Preservation of Fruit by Drying," by Messrs. McDoddie; and "Fruit-bottling," by Mr. W. H. Plowman. These were well attended, as was also the cinematograph picture-exhibition representing the scenery and industries of British Columbia.

The Society was honoured by the presence of the Right Hon. Sir Edward Grey, Bart., P.C., H.M. Secretary for Foreign Affairs, who opened the Show. He was received at the main entrance by the President (Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H.), and the Council of the Society, with the Right Hon. Lord Strathcona and Mount Royal, K.C.M.G., the Mayor of Westminster (Mr. Councillor Edward L. Somers Cocks), Sir Thomas Elliott, K.C.B., His Excellency Sir Everard im Thurn, K.C.M.G.; Captain Sir Peter Stewart-Bam,

Sir Jeremiah Colman, Bart., the Hon. Price Ellison (Finance Minister for British Columbia), the Hon. J. H. Turner (Agent-General for British Columbia), R. Rutherford, Esq. (Vice-Chairman, West India Committee), A. Bowder, Esq. (Agent for New Brunswick), who, having made an inspection of the various exhibits, were subsequently joined upon the platform by Sir Albert Rollit, D.C.L., LL.D., Litt.D., Sir Daniel Morris, K.C.M.G., V.M.H., D.Sc., J. A. Turner, Esq. (Secretary for British Columbia), E. Bullock-Webster, Esq. (Exhibition Commissioner for British Columbia), A. E. Aspinall, Esq. (Secretary to the West India Committee), W. L. Griffith, Esq. (Secretary for the Dominion of Canada), J. Obed Smith, Esq. (the Canadian Government Office), Chas. Allen, Esq (the Canadian Government Office), J. R. Boosé, Esq. (Secretary to the Colonial Institute), C. E. Musgrave, Esq. (Secretary, London Chamber of Commerce), Rev. W. Wilks (Secretary to the R.H.S.).

The PRESIDENT, in opening the further proceedings, said he was sure they all felt very grateful to Sir Edward Grey for his kindness in being present to open the Exhibition, because they all knew what an exceedingly arduous time politicians had before them at the present moment. He was also sure that, whatever were the political feelings of those present, they were all unfeignedly glad to see Sir Edward among them, and recognized their obligations to him for the way in which he conducted the Foreign affairs of the country.

This was the fourteenth exhibition which they had had of Colonial fruits, and though, unfortunately, it was shorn of some interesting exhibits, owing to the steamboats from the West Indies being delayed in their arrival, he still thought they would agree with him that the present Exhibition, taken altogether, was a very striking one; he did not think that any of the exhibitions previously held had been fuller, if indeed, so full, as the present; and for that they owed a debt of gratitude to the Colony of British Columbia for their exhibition of fruit, some of which had been in competition with fruit from other North American Colonies, and had carried off, as they were probably aware, the principal prize of £200. He was afraid they would all feel a certain amount of envy that in North America such fruit could be produced, while we had this year been suffering from gloomy skies and misty atmosphere; and it was not difficult from to-day's show to draw a happy augury for the future of the fruit industry of the North American Colonies, in which such wonderful progress had already been made. They knew how energetic, how industrious, how active, and how intelligent their North American brethren were, and they might anticipate that they would do even better in the future than they had done in the past. In common with most other people, he was personally acquainted with not a few who had gone to the North American Colonies, and their reports were of the most encouraging nature. The word "unemployment" had, he believed, never been heard in that part of the world, and he thought that anybody there who was willing to be employed would never have cause to complain of unemployment.

Another point to which he wished to refer was the wonderful progress they had made, not only in the production, but in the marketing of their fruit. Only those who grew fruit and vegetables for market knew how very important it was to present the produce in such a way as to be attractive. The selection, grading, packing, and marketing was a study in itself; and, so far as they could judge from what they saw before them, considerable progress had been made in that direction, especially in the important element of packing. He knew quite well that in certain establishments in this country fruit was now so packed that it might travel safely from one end of the world to the other without injury, whereas a few years ago, owing to rough handling on our railways, fruit like pears more often than not arrived almost in a state of decomposition. But things were very different now, and that was a matter for congratulation.

He was sorry that the produce from the West Indies was not yet there; because he thought that a great many of their fruits and products might with advantage be more largely used in this country than they are at the present time. Some progress, however, had already been made in this direction, due very largely, he believed, to the efforts of the late Sir Alfred Jones. In regard to bananas, for instance, he understood that banana flour was now extensively used for mixing with wheat flour in pastry and for various other purposes. He might also mention that one of the most excellent products of the West Indian Colonies was the West Indian ginger. The ginger they formerly had at their tables came from China and was immersed in a very dark-looking syrup. He considered the West Indian ginger very superior to that.

With reference to whether the encouragement of Colonial fruit-growing would interfere with our domestic supply, he thought it really did not. In this country, owing to the very variable climate, the amount of fruit grown in our orchards in a favourable year could never be depended upon for the year following. Taken indeed at its very utmost extent the total amount of fruit grown in this country might almost be called small as compared with the demand, and he was confident that the British fruit-growers need not look with any apprehension whatever at the beautiful fruit they saw to-day. There would always be ample demand for our own fruit, and there was more than ample room for Colonial fruit also; and were it not for the importation of fruit enabling the smaller greengrocers to keep their shops going during the season of small home supplies, British growers would, he thought, soon be complaining of circumscribed markets. He believed he was correct in saying that last year we imported 3,000,000 cwt. of apples, and no fewer than 6,000,000 bunches of bananas, which showed what an important part fruit from our Colonies played in keeping open home markets.

With regard to the production of fruit in this country, with one or two exceptions we could grow the finest examples of fruit which the world produced. No men of any nationality could grow such fine

fruit as the experienced fruit-grower in this country. For instance, at the Society's Show at Holland House Mr. Rivers was kind enough to send him a large box of cherries called 'Early Rivers.' They were very large, delightfully sweet, full of juice, and very black. He asked the Japanese Ambassador, who sat next to him, to taste some. He did, and he asked what fruit they were. In Japan they only know cherries as flowering trees; and it was some time before he could persuade the Ambassador that they really were cherries. He thanked Sir Edward Grey for his attendance; and also the ladies and gentlemen for being present in such large numbers not only to take advantage of the Show, but to give a most cordial welcome to Sir Edward.

The Right Hon. Sir Edward Grey: Sir Trevor Lawrence, Ladies, and Gentlemen,—It is a pleasure to me to be able to come here to-day to open this magnificent Show; indeed, it is a little difficult for me at this moment to remember that there is a General Election going on outside. I come to you from the Foreign Office, where we are always much too busy, even when we are not occupied with the controversial aspects of a General Election; and I come from there to you here to find you ready to admire this Fruit Show just as if there were no election in progress at all. In fact, you are, I will not say like an oasis in the desert, but you are rather like a beautiful island safe and dry in the midst of the raging torrent of the election going on outside. I trust that nothing which is happening elsewhere will interfere with the success of this Exhibition. It is really an admirable thing that the Royal Horticultural Society should from time to time hold these Exhibitions of Colonial fruit; and I should like to assure the Colonies who send the fruit that there is no better place to be found in this country in which the Show could be held, and no better auspices than those of the Royal Horticultural Society. What is being done is a benefit both to the Colonies and to ourselves; it is a benefit to us that Colonial fruit should be brought within our reach, and it is a benefit to the Colonies that their produce should be made better known to our consumers. As your President has said, there is not the least danger of its interfering with the home market. Our season is different from theirs, and with regard to the special qualities of the fruit which we produce at home as regards flavour there is no danger because our own home fruit is second to none. In the Colonies, where they have a hotter summer and a different season, they may do better in the way of colour and quantity, but hardly in quality.

One thing I am quite sure of—namely, that it would be good for this country to consume more fruit than it does, and a larger supply of fruit, so long as it is good, will increase the demand; and not only increase the demand, but will benefit ourselves as well as the Colonial growers. I have always been a partisan of the wholesomeness of fruit. Speaking as a layman without medical or scientific knowledge, if I were asked what was the limit of the amount of fruit which was good for anybody, I should answer "His cubic capacity." I do not believe

there is any danger in fruit-eating, providing the fruit is in good condition and of good quality. Therefore I regard it as true that fruit-growing should be stimulated as being one of the pleasantest and most wholesome of our industries, whether carried on here or in the Colonies.

The public has a great deal to learn yet about fruit in order to discriminate between the different qualities; and the more we discriminate the more it will tend to produce good qualities. Here, in this Hall, we are not in a position to test the flavour of all the fruit shown; but I would appeal to you all, whether you have ever seen a more magnificent Fruit Exhibition than this which has been brought here to-day. Look at the exhibit from British Columbia, which has already, I believe, gained a prize in the face of great competition in America as well as in Canada. Does it not make one feel what a beneficent thing the action of the sun is in those lands when we see such wonderful colour! We in London, especially, may envy such a sight as that which now lies before us. Then New Brunswick and the West Indies. The West Indies produce fruit which comes into competition not at all with the home market nor with Canadian fruit. The West Indies produce Grape-fruit and Limes; Grape-fruit is becoming more and more popular, and it comes into competition with nothing else. With regard to Dominica I am glad to be able to say that I have later news than even our President has. Their exhibit has already left Waterloo Station and will be here very soon.

I should like to compliment the Royal Horticultural Society on the success that has attended these Exhibitions. The Society is promoting, encouraging, and developing one of the most wholesome recreations a man can have, and that is, gardening; it is a long time since Lord Bacon said that God Almighty first planted the garden and gave us the purest of human pleasures. In the last two generations the pleasure of gardening has developed enormously in this country, and that is very greatly due to the action of the Royal Horticultural Society; and more than ever we need, as one of our human needs, gardening as a recreation to-day. The Fruit Exhibition could not be held under better auspices than those of the Royal Horticultural Society, and I can only, in conclusion, express a desire for the success —the increasing success—of such exhibitions. They must be a source of great gratification to the President, who has presided at so many of these exhibitions which have done so much, and to whom we owe so much. I congratulate the Society on having added to its other work that of exhibiting Colonial fruits, which I hope will go on year after year with increasing success.

I have much pleasure in declaring the Exhibition open.

The PRESIDENT announced that the Council of the Society had awarded an entirely unprecedented award—a Hogg Memorial Medal in gold—to the fruit collection of British Columbia. The late Dr. Robert Hogg was a very great fruitarian, and some few years ago

the medal was established in his memory, but it had never before been awarded in gold.

If Sir Edward Grey will allow me, I will repeat a remark which he made to me a good many years ago in reply to an observation which I made to him that I did not know he belonged to the Society. He said: "It is the only Society that I ever get anything out of." Now to-day he has not only got something out of it but he has put something into it through his kind presence amongst us.

This concluded the Opening Ceremony.

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An informal luncheon followed in the Council Room, where some forty gentlemen were present to welcome the Rt. Hon. Sir Edward Grey, Bart.

LUNCHEON TOASTS.

1. THE KING.

2. THE VISITORS.

Proposed by THE PRESIDENT.
Response by THE RIGHT HON. SIR EDWARD GREY, Bart., P.C.

3. SUCCESS TO COLONIAL FRUIT INDUSTRY.

Proposed by SIR DANIEL MORRIS, K.C.M.G., V.M.H.
Response by THE HON. PRICE ELLISON, Finance Minister for British Columbia, and THE HON. H. J. TURNER, Agent-General for British Columbia.

4. PROSPERITY TO THE ROYAL HORTICULTURAL SOCIETY.

Proposed by HIS WORSHIP THE MAYOR OF THE CITY OF WESTMINSTER.
Response by HIS EXCELLENCY SIR EVERARD IM THURN, K.C.M.G.

The toast of H.M. the King having been duly honoured, the PRESIDENT rose to propose "The Right Honourable Sir Edward Grey, Bart., P.C." He said he was sure they would always receive the next toast with all the warmth it deserved, and that was "The Health of their Visitors," with which he coupled the name of Sir Edward Grey, who had been kind enough to open the Exhibition. They had heard the very kind way in which Sir Edward had already spoken of the Society, and they could not help feeling particularly grateful to him, under the present urgent condition of public affairs, for giving up even a small portion of his invaluable time. He would not, in fact, have been the least surprised if the Foreign Minister had sent an excuse, which would have been quite justifiable, especially as he had to speak at Portsmouth that night and at Berwick-on-Tweed the next night. Sir Edward had many times expressed his appreciation in the kindest possible terms of the work of the Society, and he was sure that any appreciation, falling from a man in his position, with so wide a knowledge of what is being done in the world, must be highly

satisfactory to the Society. He welcomed Sir Edward Grey, and thanked him with the greatest possible warmth and cordiality.

Sir Edward Grey: Sir Trevor Lawrence and Gentlemen,—I thank you very much for the kind way in which you have drunk my health and that of your other visitors. I fear I must apologize for being obliged to be going away so soon; but certain exigencies, which were not foreseen when this engagement was entered into, have since arisen which have made a considerable demand upon my time, and I must leave in order to plunge into that raging stream outside, of which I spoke a little time ago, and which made it very doubtful whether I should be able to fulfil my engagement. In the first place, I am glad to have had the opportunity of seeing this Show for its own sake, because it often happens in election times, and sometimes out of election time, that one is so occupied with politics that a show of the Royal Horticultural Society is let go by without being seen. But when one has to open the Show, one has at any rate the satisfaction of seeing it; and I have very much enjoyed what I have seen. I have some little interest, too, in meeting Sir Daniel Morris to-day, with whom I was a colleague in the West Indies some little time ago, and because I know that a part of the work of the Commission on which he and I sat was the establishment of direct communication between the West Indies and this country; and I believe that that communication has had a direct influence upon the presence here of West Indian fruit. I have already said that I am much indebted to the Royal Horticultural Society. Our President said that I told him that it was the only Society which I got anything out of. No doubt I did say that to him, because I have often said something very like it to a good many people; but I think I put it even stronger than that, and said it was the only Society I knew of from which one got not only something, but a good deal more than the value of one's subscription. And I am glad for that reason to have been able to take part in the proceedings to-day, because I am always looking forward to the time when I shall have more leisure than I have at present; and, when that time comes, I look forward to making still greater use of the benefits to be obtained from our Society. I am especially sorry that I cannot stay for the next toast, because I should have liked to hear Sir Daniel Morris and others on behalf of the Colonies; but the compulsion of the outside engagements which I have to fulfil is upon me, and I must leave you with an apology, only again renewing my thanks for your most kindly welcome.

"Success to the Colonial Fruit Industry."

Sir Daniel Morris: Sir Trevor and Gentlemen,—In giving the toast with which I have been entrusted I shall be as brief as I possibly can in view of the engagements which so many of us have to meet to-day. The toast which I have the pleasure of giving is "Success to the Colonial Fruit Industry." I am reminded that twenty-three years ago I read a paper before the Royal Colonial

Institute on "Fruit as a Factor in Colonial Commerce." In that Paper I reviewed the situation at that time; and I wish I could place before you the changes which have taken place since. But I am delighted to find that the Royal Horticultural Society is taking so active a part in bringing the fruit industry of the overseas Colonies before the people of this country. This Society is doing a very fine piece of Imperial work. I heard a gentleman, when on a short visit to this country from the West Indies, say that this Society was incurring considerable expense in connexion with these fruit shows; and I am glad to find that the Society, as a result of its interest in these fruit shows, is getting a continually increasing number of Fellows, and becoming year by year more prosperous. I think it would be impossible for me to propose this toast without a reference to the valuable work being done by the Royal Horticultural Society in encouraging these fruit shows and bringing them to the notice of the people of this country: they are doing a great deal in that way to develop the prosperity of the overseas Dominions. I have been assured by the Agent-General of British Columbia that the fact that this Society has so often given opportunities for showing the magnificent products of that country has resulted in his being asked many questions about British Columbia, with the result that a large number of people are going out there to settle as permanent Colonists. That is another benefit arising out of these fruit shows.

I would also echo what was mentioned by Sir Trevor Lawrence with regard to the splendid work done by the late Sir Alfred Jones in developing the banana industry, which has now assumed enormous proportions. In 1887 only a few bananas came to this country, and even they came from the Canary Islands; but at the present time, of the total amount of bananas which comes to this country, by far the greater proportion comes from our own Colonial possessions.

With this toast I have the pleasure of associating the names of the Hon. Price Ellison, the Minister of Finance for British Columbia, and the Hon. H. J. Turner, the Agent-General for British Columbia. On the last occasion Mr. Turner was unable through ill-health to be present; and we congratulate him and ourselves on his presence to-day, and accord him a very hearty welcome for the thorough manner in which he supports the Society's efforts with regard to the exhibits from British Columbia.

The Hon. Price Ellison, Minister of Finance, British Columbia: Gentlemen,—It gives me very great pleasure indeed to be here to-day at one of the greatest meetings of horticulturists in the world. I have often heard of this great Society and of the good work it has done. I understand from the Hon. H. J. Turner that some years ago, when he was Premier of British Columbia, he took a very active part indeed in bringing to the notice of horticulturists that the Colonies ought to exhibit. That is very important, and it has been more important to British Columbia than to any other North American Colony. For six years in succession British Columbia has captured the highest award

this Society can give, and that is something to be proud of; we appreciate it very much indeed. Having had experience during a large number of years, I know that people exhibiting here, whether they win a prize or not, are perfectly satisfied that justice has been done, and we all feel proud of it. It is only a few years since we took up commercial fruit-growing. It was first started by Lord Aberdeen. He bought an estate of 13,000 acres, and was the first to demonstrate that fruit could be grown with us on a commercial basis. That led other people to go into the industry, with the result which you see to-day. If there is anything finer to be seen in the world, I do not know where you can see it; besides which, this fruit has not been grown by men who have been trained for a lifetime in the work. You can go out there, and you will find a man who left the City of London only a few years ago, but he has captured a prize, and he now knows more about fruit-growing than any of us. It is the climate and the sun and the glorious weather, to which we attribute this great and grand success that British Columbia has achieved here to-day. A few years ago we had not an apple to sell. Last year there were brought to British Columbia, I think, over 2,000,000 dollars for fruit alone. I am not sure but that in a few years' time it will be ten times as much for fruit alone.

But that is only one of the great industries of British Columbia. We have gold, silver, lead, zinc, iron, fish, timber, and everything that goes to make a great nation, and a country that will grow wheat for years, enough to supply the whole of England. That is in British Columbia alone, to say nothing about the vast provinces of Manitoba and others of the great wheat-producing districts of Canada. We ought to be proud that we are under the great and glorious flag, the "Union Jack." You need never go outside the bounds of our Colonies to get all that this great and glorious nation will require for anything that goes to make a great nation. I thank you very much indeed for having given me the pleasure of saying a few words as Minister of Finance and Agriculture for British Columbia. I wish to thank you all, and I hope and trust that this Society will go on in the future doing as good work as it has done in the past. On behalf of the Province of British Columbia, I shall have very great pleasure indeed in subscribing twenty-five guineas towards the expenses of this Show.

The Hon. H. J. Turner: Sir Trevor and Gentlemen,—I assure you it gives me great pleasure to have the honour of being one of the responders to this toast. It is very gratifying, I think, that we have here the Minister of Agriculture and Finance. He has just indicated that he is the Minister of Finance by giving what I think is only due from British Columbia to this Society, except that I only wish we could double it.

I have said it gives me great pleasure to be one of the responders to this toast, and I have very good reasons for saying that, because I have seen the history of these Colonial Fruit Shows from the beginning. When I came to England some nine years ago, I was already

a very enthusiastic gardener, and I think I introduced some of the first English trees and flowers to British Columbia—at any rate, I know that I had the first Ribston Pippin tree in the Province. My garden was very successful, through the assistance of an employé, himself a Fellow of this Society, Mr. Leach. So that I know something of the early horticulture of the Province. But my connexion with the Colonial Fruit Shows is this: In 1901 I came to this country—of course, I am an old Londoner, but I lived abroad a great many years—and I very soon decided to join the Royal Horticultural Society, if they would have me, as a Fellow. They did; they kindly elected me. Shortly after my election I approached the Society in the hope of getting them to allow British Columbia fruit to be shown here. In 1902, or before that, your Secretary, Mr. Wilks, kindly offered to exhibit any fruit I could get hold of. Then I corresponded with the Colonial Government, and in 1903 they advised me that some fruit was on its way to England. When it came to me, instead of being packed like it is now, you can imagine my disappointment when I found that all the apples had been carefully sealed up in glass tubes and preserved in some liquid for exhibition here. However, that fruit was exhibited at one of the Society Shows; and, owing to its being, I think, the first Colonial fruit sent home for exhibition, it attracted a great deal of attention, although in glass tubes, and as an acknowledgment of my efforts the Society kindly awarded me personally a medal, which I preserve with great care, and which I look on as a reward for introducing the first Colonial fruit into England.

I think the Colonies are immensely indebted to this Society; but they do not yet sufficiently appreciate the work which has been done by the Society in connexion with these fruit shows, and they do not realize that the Society has not only done so much for these shows disinterestedly, but at very considerable expense to itself; and that is the reason why the Colonies do not respond as they ought to do. For instance, only two Provinces of Canada have exhibited to-day—New Brunswick and British Columbia! I am delighted to see that New Brunswick is coming to the front, because that country is eminently adapted for fruit-growing; it does not, perhaps, quite equal Nova Scotia in that respect, but no doubt they will come to the front and be one of the future suppliers of fruit to this country. British Columbia is in quite a different position; their exhibits were not sent with a view particularly to selling the fruit. At the time I wrote to the Government, the idea we had in mind was that Great Britain wanted education as to what the climate and the conditions existing in British Columbia were. I found there was immense ignorance here in that respect, which was not to be wondered at, because British Columbia was shut off from the world before the Canadian Pacific Railway was built, and it takes time to open up a country so distant as that. My earliest correspondence was very limited, but now it amounts to hundreds of letters a day making inquiries, which indicate the great ignorance in this country of what are the conditions prevailing on the North-West

Coast of America. Being called "North-West," it was thought to be far North, and to have a terrible climate. Some of the questions asked were: "What sort of fur clothing must I buy?" and such-like. "Can you advise me the best place to buy a fur overcoat, or should I buy one after crossing?" Others seemed to have the idea that British Columbia was connected with the State of Colombia far down South, and they wanted to know how long the intense heat lasted. So I thought if we could get here some fruit from British Columbia it would tell them a great deal more than I could by letter. They look at the fruit, and they appreciate that, on the one hand, it cannot be grown in a torrid climate, but, on the other, that it cannot be grown without a lot of sunshine. That was the origin of British Columbia sending over fruit, and it has answered most thoroughly. I find, generally speaking, that my letters speak of fruit shows going on in various parts of the Colony during the last month, and they speak of the climate as good and of the country as a place in which they can work. What I want to see is the other Provinces coming to the front; they do not realize that these shows are the best possible form of advertising the actual conditions as to climate and fertility of the land in the different Provinces. There are plenty of Provinces in Canada besides British Columbia, though, as a British Columbian, I say we can "knock spots off" all the others; but I expect some gentlemen present will not agree with that, but British Columbia has had advantages which other Provinces have not had. We began with the experience of others. And what was the effect of beginning late? We saw that both in Great Britain and in all the other Provinces and Colonies sufficient attention had not been paid to keeping the orchards thoroughly clean and free from insects and pests of all kinds. With the co-operation of the Dominion Government, we have been able at our Customs and ports of entry to have all fruit-trees and all fruit examined, so that none can enter into British Columbia unless it is thoroughly free from dangerous pests. My friend, Sir Albert Rollit, perhaps thinks that I am approaching dangerously near to a topic on which we differ, because if I mention the word "Protection" I should not be keeping to the rules of the Society. But the only protection I want is that of our gardeners and our orchardists from the trouble of these fruit pests. The early orchards in British Columbia—we knew nothing about them at that time—resembled deformed or crooked trees, such as one sometimes sees on the journey to Kew Gardens. None of these exist in British Columbia to-day. It was not an agreeable thing to inform a fruit-grower at that time, but the Agricultural Department of the Province did take it up, and wherever they found that a man did not improve his orchard they cut his trees down. I believe that Mr. Price Ellison will agree with me that that policy was a good policy, and the result is that we have practically splendid fruit. I see in many shops in London plenty of fruit that would not be allowed into British Columbia. A large number of oranges which I see here could not go into British Columbia, because they are very often affected with

scale. The same with regard to some of the apple-trees I see here. It is, no doubt, a difficult thing for an old country like this, but you see how it was done in British Columbia—we nipped it in the bud and stopped it at the right time, and I believe that with the regulations they are carrying out now British Columbia will be kept clean.

I cannot sit down without thanking the Council and Officers for the kindly way in which you have provided for this Exhibition. Such exhibitions are of immense importance, not only to the Colonies, but also to the Mother Country, because they bring people from all parts of the Empire together. There is nothing better than showing the fruit of a country; it reminds one of home, sitting under one's own fig-tree; we cannot invite you to do that, but we can invite you to sit under our apple and pear trees in British Columbia—and you will very often be glad of the shade. Someone mentioned the climate. I have a letter from a friend in Victoria dated a month ago saying that they heard we had rather a bad season in London. He said, "this is the seventy-ninth day in Victoria that we have been without rain, except a few drops on two or three days; we should have liked a little more, but still our crops are good, and we shall be able to make a good show this year." I might add that the island of Vancouver does not grow quite such brilliantly coloured fruit as some places on the mainland; but that little island can grow—I was going to say—the best quality in the world, but I will say equal to the very best grown in England. They can grow strawberries, and they are the only people in the world who grow strawberries equal to your English strawberries. I remember many years ago, when in New York, hearing the great Beecher, after he had paid a visit to England, preaching sermons on his trip to England; and he said, "For the first time in my life I ate a strawberry, and it was grown in England."

I thank you for the kind way in which you have received the toast; and I hope measures will be taken to ensure in future a representation from all the Provinces of Canada and the other Colonies of this great Empire.

"Prosperity to the Royal Horticultural Society."

The Mayor of Westminster: I am greatly to be envied in proposing this toast, I think; because, whatever controversy is raging outside, this toast is quite uncontroversial; and however feebly I propose it, I am quite certain it will be received with the greatest pleasure. It is hardly necessary to propose "Success to this Society"; for does it not succeed? But it has been my good fortune to be connected with this Society for some time; and I must say that it is simply extraordinary how gardening, as taught by this Society, has caught hold upon all ranks and classes of the people. I know the enormous amount of work the Society has done and is doing every day to foster the love of gardening, and I think it is not too much to say that the whole Empire is richer to-day for these efforts. Anyone who has any knowledge of gardening will endorse my words. The appearance of

window-boxes in the East End of London has been one of the conspicuous features of the last few years; and I think we may say that from the manor house in the country to the window-gardening of East London the advance is everywhere self-evident, and to a very great extent it is due to this grand old Society. I propose the toast of "Prosperity to the Royal Horticultural Society," long may it flourish, root and branch.

His Excellency Sir Everard im Thurn: Sir Albert Rollit and Gentlemen,—I am very grateful for the unexpected honour given me of expressing the thanks of my fellow-members and myself for the kind and encouraging words that have fallen from his worship the Mayor. I am a little surprised at the duty of responding being committed to my charge, because for a great many years I have been abroad, chiefly in the Colonies, and I have very seldom been able to do any service at all for the Society; but I think that was perhaps the reason why our Secretary specially fixed upon me, because he knew that I had seen the working of the Society from a distance as well as being a Fellow of it myself. I have thoroughly appreciated and enjoyed the Journal of the Society in those distant lands where my lot has been chiefly cast. I also know that the Society has done immense service, not only to horticulture here in England, but by the help it has given to many distant Colonies; so that I, possibly more than most of the Fellows of the Society, may accept the compliments paid to the Society with greater modesty than those who have been working hard with it at home. I thank the Mayor for his kind wishes for the Society, and I would also like to thank all the other non-members of the Society who have spoken either here or down below to-day.

Sir Thomas Elliott (Board of Agriculture): Gentlemen,—I have no desire to speak, except to say that I have been extremely gratified by the speeches we have heard to-day; and, I would add, that as an official representative of agriculture and also of horticulture it is always a pleasure to me to come in contact with the Council and Officers of the Royal Horticultural Society. On all the hoardings at the present time I see appeals to us to think Imperially. I think the Royal Horticultural Society thinks Imperially. I have a sort of idea that the Society did go to sleep once, but during the last twenty-five years they have been waking—they have wakened up. I also want to say this: I come into contact with a vast number of horticulturists, and I always expect to be asked, What can the Board of Agriculture do for horticulture? but I am bound to say that I hear very little in that direction, because the R.H.S. is doing for horticulture much better things, in my judgment, than any Government Department can possibly do; and so long as the R.H.S. is doing its present work, there is not much room for the Board of Agriculture to step in. We have had some little experience in diseases of potatos and fruit trees; but you know what kind of reception growers give to inspectors of a Government Department. Our fellow-citizens in British Columbia should exercise great care; a great deal of educational work has to be

done with reference to the pests to which growers are subject; and I can assure you that whatever this Society desires the Board of Agriculture to do in that connexion we shall be only too happy to do. In conclusion I would just say this: that if at any time your Society finds that the Board can do anything to help your efforts for horticulture, tell us what it is and we will do our very best to meet you. I do feel that for some years past the R.H.S. has been doing a larger and a better work, and, in my judgment, it ought to continue so to do. But as regards the Board of Agriculture, if we can do anything supplementary to yourselves you have but to ask us. I have much pleasure in asking you to drink the health of Sir TREVOR LAWRENCE, our Chairman at this pleasant gathering, and of Sir ALBERT ROLLIT, who is at the moment acting for the President.

Mr. RUTHERFORD: I should just like to express my regret that the fruit meant for show from Dominica has not yet arrived; it is no fault of Dominica, but is entirely due to the breakdown of the steamer carrying the produce. Had she arrived in time you would have seen a most excellent show; and I wish to impress upon this Society that it is not through any lack of organization on the part of Dominica, but is purely and simply caused by a delay in the arrival of the vessel carrying the exhibits.

Sir ALBERT ROLLIT: It only remains for me to acknowledge the concluding toast, which Sir THOMAS ELLIOTT has so felicitously proposed. The President of this Society is its strength in all departments; we could not have a better leader, and no leader could have more loyal Fellows on his Council; I say that with emphasis. In the next place, when we speak of the success of these meetings, we ought not to forget our venerable Secretary. You know that in olden times when people had been convicted of the highest crime of misdemeanour, they were entitled to "Benefit of Clergy." Now, without having committed any special misdemeanour, we, the Council of the Society, always have benefit of Clergy; and I do not hesitate to say that no Society is better served than we are by our esteemed Secretary, either as Secretary or by good fellowship. I think I might say the same thing of our Assistant Secretary, who is most attentive, energetic, and zealous.

You have been asked and implored to think Imperially; I am going to be more mundane, and I merely say that I hope you have enjoyed the Imperial pint and the reputed quart of this Society. It has been a great pleasure to us to entertain you. I particularly welcome our friend the representative of British Columbia, which is a country of very great interest. I shall always appreciate the humour of the people of British Columbia, who say of themselves and of their salmon: "We eat what we can; and we can what we can't," and in that way contribute to the Imperial supply. With regard to Dominica, I am pleased to hear that their exhibit will be arriving to-night, and so supplementing what is already a most excellent Exhibition. I take this opportunity of acknowledging the great kindness of the authorities in

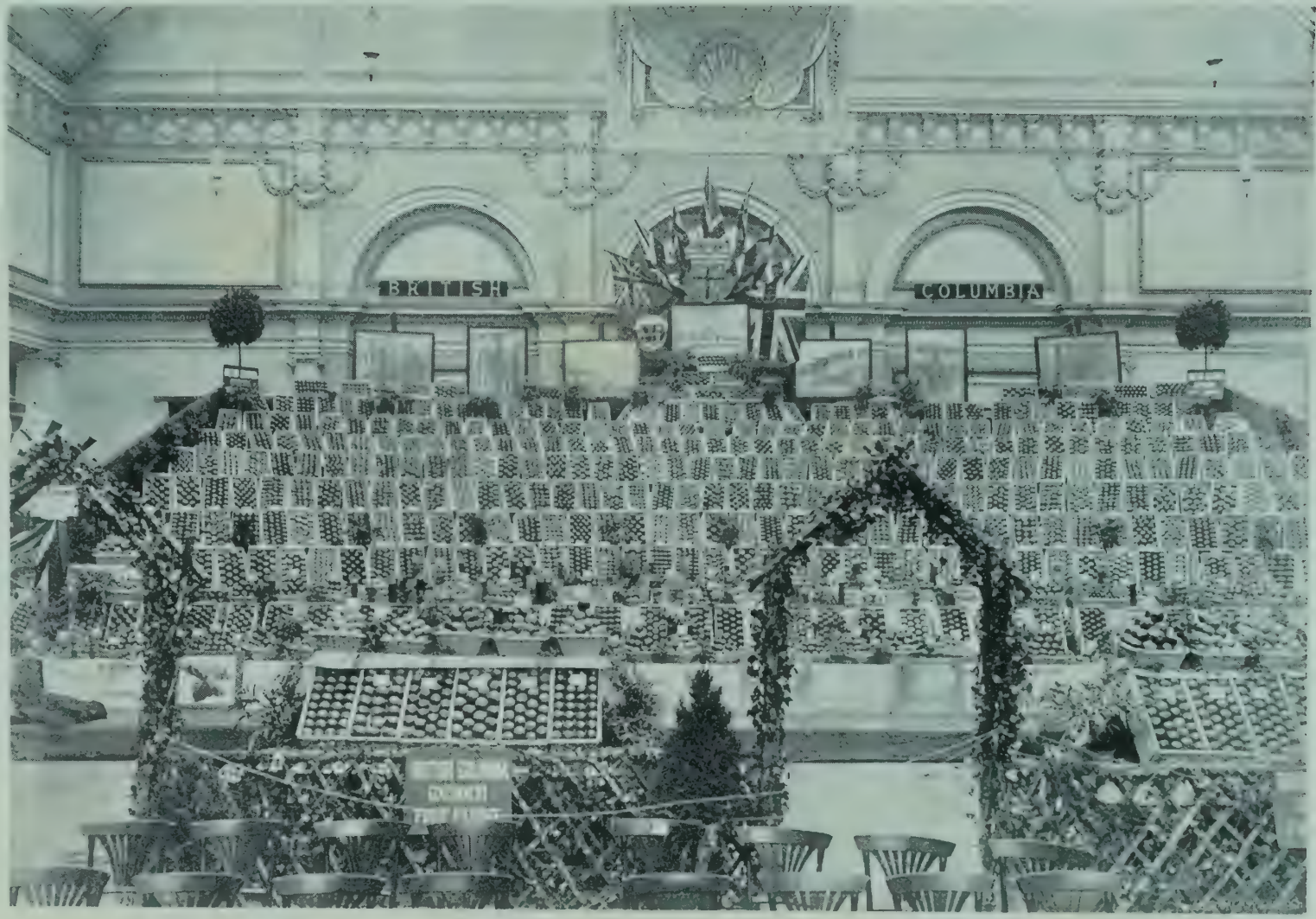


FIG. 183.—THE EXHIBIT OF FRUIT FROM BRITISH COLUMBIA AT THE BRITISH FRUIT SHOW.

(*To face page* ccxlii.)

Dominica in sending me personally some grape-fruit plants, which are alive, and which I hope will some day give me fruit, and so make a slight addition to the horticulture of this country. When we meet in common fellowship representing one and the same Empire, we all have the feeling of the Mother Country and her daughters, that splendid assemblage foreshadowed in Elizabethan days and realized to-day: "England she stands with all her daughters around her, mistress of the seas, and heiress of the lands beyond the seas." That heritage has come to pass; and when we speak of the great advance in the world of common citizenship, I think we may say that we are fulfilling a mission to the world in transmitting from this small centre to the utmost confines of the globe the sense of power and the privilege of British liberty and love. On behalf of the President, who was obliged to leave us a few minutes ago, and on my own behalf and that of all the Council, I thank you for drinking this toast, and will only add that we know no greater pleasure than welcoming our friends from beyond the seas.

JUDGES.

Colonial Fruit.

Geo. Bunyard, V.M.H.	G. Monro, V.M.H.
Geo. F. Butt.	A. H. Pearson, J.P., V.M.H.
C. R. Fielder, V.M.H.	Sir Albert K. Rollit, D.C.L.
M. Garcia.	F. Smith.
Jas. Hudson, V.M.H.	A. M. Walker.

Colonial Preserves.

W. Marshall, V.M.H.	C. Herman Senn.

LIST OF AWARDS.

Gold Hogg Memorial Medal.

To the Government of British Columbia, for a collection of Apples, comprising over one thousand cases. (This award was given for the whole exhibit.)

Gold Medal.

To the West Indian Produce Association, 4 Fenchurch Buildings, London, E.C., for West Indian produce, including Citrus Fruits, Liqueurs, and Preserves.

To the Exhibition Committee of Dominica, West Indies, for Citrus Fruits, &c.

To the Summerland Agricultural Association, represented by Messrs. Garcia, Jacobs & Co., Covent Garden, for British Columbian Apples.

Silver-gilt Hogg Medal.

To the Botanic Station, Dominica, W. I., for Citrus Fruits.

Silver-gilt Knightian Medal.

To the Salmon Arm District, British Columbia, for Apples.
To Messrs. Randall Bros., Sheffield, New Brunswick, for Apples.
To Messrs. J. C. Gillman, New Brunswick, for Apples.

Silver-gilt Banksian Medal.

To the Grand Forks District, British Columbia, for Apples.
To the Vancouver Island District, British Columbia, for Apples.
To Mrs. Smith, Spence's Bridge, British Columbia, for Apples.

Silver Knightian Medal.

To the Government of New Brunswick, for 50 boxes of Apples.
To Mr. W. C. Staples, New Brunswick, for Apples.
To St. Aroment Estate, West Indies, for Lime-products.
To the West Kootenay District, British Columbia, for Apples.
To the Okanagan District, British Columbia, for Apples.
To the Kamloops District, British Columbia, for Apples.
To the Keremeos District, British Columbia, for Apples.
To the Jamaica Agency, London, for Citrus Fruits, &c.
To Messrs. Westmacott, for Colonial Wines, Liqueurs, and Jams.

Silver Banksian Medal.

To the Kootenay District Agency, British Columbia (representative, H. E. Croasdaile, Esq., 7 John Street, Adelphi, London, W.C.), for Apples.
To Mr. J. W. Clark, New Brunswick, for Apples.
To Mr. G. H. Laws, British Columbia, for Apples.
To the Everton Estate, Dominica, West Indies, for Citrus Fruits.
To the Wall House Estate, Dominica, West Indies, for Limes.
To Messrs. Elders & Fyffes, London, for Jamaica Citrus Fruits.
To the Army and Navy Auxiliary Stores, London, for Colonial Fruits.

Bronze Banksian Medal.

To the Roseau Valley Fruit Company (manager J. Hankinson, Esq., 46 Swan Street, S.E.), for Colonial Preserves.
To the British Columbia Development Association, 114 High Holborn, W.C., for a collection of Fruits, Books, and Pictures.

Class for Four Boxes of Dessert Apples.

First Prize (Silver Cup), Mr. R. H. Fortune, British Columbia.
Second Prize (50*s*.), Mr. J. W. Cockle, Kaslo, British Columbia.

Miscellaneous and Industrial Exhibits.

Silver Knightian Medal.

To Mr. W. H. Plowman, 20 Rampayne Street, London, S.W., for an interesting collection of patent sterilizers, including the "Rex," the "Fernleigh," the "Mercia," and the "Abbott"; also a collection of

bottles used for the preservation of whole fruits, illustrating the various improvements which have been effected in their shape and fastenings during the past ten years.

To Messrs. McDoddies, Kennington, for dried vegetables.

Silver Banksian Medal.

To the National Fruit and Cider Institute, for Cider and Cider Apples.

GENERAL MEETING.

December 6, 1910.

Sir Albert Kaye Rollit, LL.D., D.C.L., in the Chair.

Fellows elected (33).—Mrs. G. Alexander, A. B. Berney, F. J. Branthwaite, Mrs. E. Bromley, Lieut.-Colonel G. D. Carleton, Rev. E. H. P. Carter, Captain C. R. Colvile, T. Lloyd Davies, Mrs. W. Earle, Miss D. Elias, Mrs. Fetherstonhaugh, Miss E. M. T. Franklyn, T. W. Hagan, Miss Hatfield, Mrs. E. Kensington, Surg. Lieut.-Colonel C. N. Kilkelly, C.M.G., M.V.O., Richard le Doux, E. H. M. Pearson, Allan H. Purcell, James E. Purcell, Mrs. H. Rendel, Mrs. N. M. Richards, Mrs. Roberts, W. R. Rogers, Mrs. C. E. Swaine, Dr. G. Templeton, F.R.C.S., Harry Tinley, Mrs. G. M. Walmsley, J. Oliver Walter, E. W. Warters, Mrs. Weekes, Vyvyan Wells, Miss K. West.

Fellows resident abroad (2).—H. F. du Pont (U.S.A.), T. C. Kong (India).

Societies affiliated (4).—Carlisle and Cumberland Horticultural Association, Central Telegraph Office Gardening Association, North Warwickshire Horticultural Society, the South-Eastern Postal District Horticultural Society.

A lecture on "The Cooking of Vegetables" was given by Mr. C. Herman Senn (see p. 587).

GENERAL MEETING.

December 20, 1910.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (75).—P. H. Aston, Mrs. L. Balfour, Mrs. G. C. Bell, Mrs. W. B. Bryan, C. H. B. Caldwell, Mrs. L. Callcott, Mrs. M. Carroll, Mrs. R. Cartwright, Miss D. M. Cayley, W. R. Clarke, L. E. Clift, Mrs. C. Cobb, J. Collier, J. H. Colman, N. L. Davidson, Mrs. A. Dovey, Miss A. Draper, J. Dudman, E. MacG. Duncan, E. Fisher, G. Gally, Miss D. M. Goldring, J. H. E. Green, Mrs. M. A. Green, Colonel P. Hargreaves, J. M. Holman, Colonel P. D. Jeffreys, C.B., Mrs. H. Keane, K. E. King, The Master of Kinnaird, W. F. Lane-Scott, Miss V. C. Liddell, H. J. Lindeman, Miss E. B.

McClelland, J. Macfarlane, Mrs. M. Macmillan, Mrs. Cyril Maude, Miss A. M. Moulson, Miss E. M. Moulson, Dr. W. F. Nehs, Mrs. S. Neumann, Captain R. Oakley, Rev. A. W. Owen, F. A. Phillips, Mrs. L. Pilkington, Mrs. H. F. Plumptre, Miss Rains, F. P. Scholte, J. P. Scott, J. E. Shill, Miss M. A. Smith, Mrs. Martin Smith, Mrs. Morton Smith, Miss M. E. Stanford, Miss S. Stannard, A. Stephen, Mrs. V. Stockley, E. Tappenham, H. H. Thomas, J. C. Thompson, Mrs. T. R. Thornbery, Mrs. A. Tooth, P. Turnbull, Mrs. A. Underhill, E. H. Walpole, Colonel E. S. Warde, Lieut.-Colonel G. V. Wellesley, Sir Henry A. White, C.V.O., Mrs. Wightman, J. F. B. Wilkinson, Mrs. Wilson, Miss D. Wright.

Fellows resident abroad (3).—W. Park, J.P. (N.Z.), Bernard O. Taylor (S. Africa), Dr. Pehr Olsson-Seffer (Mexico).

Associates (2).—F. Jones, F. W. Tayler.

Society affiliated (1).—Burnham (Som.) Horticultural Society.

SCIENTIFIC COMMITTEE.

SEPTEMBER 13, 1910.

Prof. G. S. BOULGER, F.L.S., in the Chair, and five members present.

Fruit of Hippeastrum calyptratum.—Mr. Worsley showed a mature fruit of *Hippeastrum calyptratum*, drawing attention to the membranous ring which, attached to the style and the top of the ovary, is separable at maturity intact, and to the deep lobing of the fruit at the base, which is not shown in published figures, these having apparently been prepared from immature fruits.

Plantago media bracteata.—Messrs. Barr sent an excellent specimen of this plant, in which the bracts are so enlarged that they form a dense rosette of closely packed and evidently spirally arranged, ovate, green leaves at the apex of the peduncle. The axis elongates but very slightly as it gets older.

Maize inflorescences.—Mr. A. Turner, Chelmsford, sent staminate inflorescences of maize, in which some of the flowers had been replaced by pistillate ones; and branching cobs, some of the branches of which bore staminate instead of pistillate flowers.

Fasciation in Vegetable Marrow.—Mr. W. H. Martin, Haslemere, sent an example of a fasciated stem of vegetable marrow between four and five inches broad.

Reversion in Radishes.—The Rev. Prof. Henslow, V.M.H., sent the following communication: "Pliny tells us that the Greeks discovered how to turn the rape into the turnip by sowing the seed in a very heavy soil. M. Languet de Sivny found that the seeds of short-rooted carrots, when sown in the alluvial deposits in France, yielded immediately in the first generation long-rooted plants. M. Carrière found that seeds of the wild radish (*Raphanus Raphanistrum*) gave a majority of long roots in the light soil near Paris, but turnip forms in a heavy soil in the south of France. I sowed the seed of the turnip-radish in a prepared, very light soil; of thirty plants twenty were long-rooted, and ten produced the normal forms, thus corroborating M. L. de Sivny's experience. The point to notice is that the turnip and long-rooted radishes come true, as a rule, from seed, as well as the short and long carrots, &c. We have here distinct varieties with hereditary characters, originating solely from the 'direct action' of stiff or light soils, illustrating Darwin's contention that varieties arise 'without the aid of selection.'"

The Influence of Starvation on Sex.—Prof. Henslow also wrote as follows: "It is well known that the male flowers of monœcious trees, as oaks, are generally on more slender shoots than the females. So, too, in diœcious herbs the females are, as a rule, on stronger plants than the males. The following experience illustrates both these facts.

Finding *Mercurialis annua* to be an abundant weed in the allotment grounds at Hythe, I collected some seed and sowed it very thickly in two 3½-inch pots. In one, of a total of twenty-five seedlings, sixteen were male and nine female. In the other there were seventy-three plants: of these thirty-nine were male and ten female, the remainder were too starved to produce flowers at all. The males, therefore, formed 74 per cent. of the total, and the females only 26 per cent. Not one of the plants was above four inches in height, but the females were decidedly stouter than the more slender males." (See also p. ccli.)

Hybrid Primula.—Messrs. Jas. Veitch sent a plant of *Primula japonica* × *P. Bulleyana*, which they had named *P.* × *Briscoei*. The habit of the plant, which was of vigorous growth, was that of *P. japonica*, but the scape resembled *P. pulverulenta*, and the flowers were in colour and form more like those of *P. pulverulenta*.

Helenium with Virescent and Proliferous Flowers.—Mr. Marshall showed specimens of *Helenium grandicephalum* with virescent and proliferous flowers. (*Cf.* JOURNAL R.H.S. vol. xxvii. (1903), p. 943.)

Sporting in Bouvardia.—A pink sport from *Bouvardia* 'President Cleveland' was sent. The branch sprang from the base of the plant and all flowers borne upon it were pink.

SCIENTIFIC COMMITTEE, SEPTEMBER 27, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

Bulbs decaying.—A number of Narcissus bulbs teeming with bulb mites and in a decaying condition were received for examination. It seemed certain that the mites were the cause of the trouble, though doubt is sometimes cast upon this idea. On this point Mr. A. D. Michael wrote: "I have investigated the question of the injury done by the bulb mite to the best of my ability, and for the purpose of tracing the life-history have kept specimens frequently under observation in confinement throughout their whole development from egg to adult. I have found it best to feed them on sound, healthy bulbs, which they eat with avidity. . . . I have no doubt but that they attack healthy bulbs, and I look on the creatures as true destroyers." (See also "British Tyroglyphidæ," vol. ii., Ray Society, pp. 92-95.)

Catasetum sp.—Mr. G. Rae Fraser, of Letchmore Heath, sent a pistillate flower of a species of *Catasetum* from Trinidad, which Mr. Rolfe considered to be probably *C. macrocarpum*, but as the pistillate flowers of the different species of *Catasetum* are so similar to one another, there is a little doubt about the name, which can only be settled when the male flowers appear. The whole inflorescence has, by the kindness of Mr. Fraser, been deposited in the Kew Herbarium.

Fasciation in Euphorbia Cyparissias.—A well-marked example of fasciation in the stem of this *Euphorbia* was shown.

Museum preparations.—Dr. J. A. Voelcker showed a section of a woody stem prepared in the same manner as those of zoological

anatomical specimens shown by him last year. (See vol. xxxv. p. ccxxiii.) The section was immersed in a fluid which rendered it practically transparent, and made its structure throughout evident to the eye, although the specimen was about $\frac{1}{8}$ inch thick. The mixture of oils and ethers, &c., which renders this mode of preparation possible, is the discovery of Professor Werner Spalteholz, of Leipzig University.

Oak galls.—Mr. J. Fraser showed a number of Oak galls from the common Oak, and commented upon the variety that may be found even upon a single leaf.

Variations in Rye Grass.—Mr. Fraser also showed some specimens of *Lolium multiflorum* (=*L. italicum*), which he had collected on a rubbish heap, to illustrate the wide variation in the form of the inflorescence of this species. One of them had the spikelets set very close together on the rachis, and was apparently the form *cristatum* of C. T. Timm a rare form analogous to *Lolium perenne* var. *cristatum*, which is much more common. Another had a branched spike with two or three empty glumes at the base of each branch and scarcely-awned outer glumes, appearing to be a hybrid, probably between *Lolium multiflorum* and *Festuca pratensis*.

Variation in Acer.—From Mr. Beamish, of Glounthaune, Co. Cork, came a specimen of the Japanese Maple 'Likonishke,' with branches showing very much the character of the stock upon which it had been grafted, arising considerably above the place of grafting. It was thought probable that the variation might be due to the tendency of the variety to vary.

Frost injury.—The Secretary produced a draft of the report on the damage done by frost during the winter 1908-9. (See p. 358.)

SCIENTIFIC COMMITTEE, OCTOBER 11, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and thirteen members present.

Buds on leaves.—Mr. Worsdell, F.L.S., showed leaves of *Verbascum nigrum* affected by some disease, now under investigation, which causes the production of numerous adventitious buds around the margins of the leaves. Masses of small buds are also produced around the base of the stem.

Lycoris aurea, &c.—Mr. Worsley showed a flowering spike of the Chinese *Lycoris aurea*, which he found succeeded and flowered well when planted out in a house. He also showed flowers of the South African Composite, *Cryptostemma calendulaceum*, which is very sensitive to frost, but which ripens seed early, and so succeeds in maintaining itself.

Modified flowers of Erica cinerea.—Mr. Bowles showed, on behalf of Mr. L. R. Russell, of Richmond, a form of *Erica cinerea* in which the flowers were replaced by deep red groups of closely packed leaves arranged in fours, as in the flowers of normal plants, not in threes, as the foliage leaves are usually. The case was similar to that described

and figured in the *Journal of Botany*, 1909, pp. 437-9, by Dr. Rendle from wild plants collected near Axminster, except that in that instance ordinary flowers were also produced. Although no stamens were produced, carpels and apparently good ovules were borne in the centre of the groups of leaves.

Fasciation in Chrysanthemum uliginosum.—Dr. Scott sent specimens of this plant with fasciated stems, in some cases separating before producing flower heads, and in others remaining fasciated until the flowering stage was reached, so that the head appeared as though two or three were joined.

Double-flowered Tropaeolums.—Mr. Arkwright, of Lyonshall, Herefordshire, sent flowers of some double Tropaeolums which he had raised. One or two of the plants were climbers, and there were among the plants more than a dozen distinct variations in colour. The flowers were regular and had no stamens or carpels.

SCIENTIFIC COMMITTEE, OCTOBER 25, 1910.

Rev. Prof. HENSLOW, M.A., V.M.H., in the Chair, and twelve members present.

Malformed Orchids.—Mr. Bowles, F.L.S., exhibited, on behalf of Mr. Hudson, V.M.H., a malformed *Dendrobium* showing doubling of some of its parts. It was referred to Mr. Lionel Crawshay for examination and report (p. cclii).

Fodder plant.—Dr. A. Voelcker showed the basal part of a plant used in Mexico as food for cattle. The portion shown consisted of the overlapping basal portions of the leaves (their upper parts having been removed), and the axis from which they had sprung. The mass measured about 12 inches in diameter and was about 10 inches deep. The leaves are exceedingly glossy and hard. The mass is broken up with a chopper and fed to cattle, which devour it greedily. It contains about 2 per cent. of cane sugar. It is apparently from a species of *Dasylirion* and belongs to the *Liliaceae* (later identified by Mr. E. M. Holmes as *Dasylirion glaucophyllum*).

Nerine crosses.—Mr. A. Worsley showed a spike of *Nerine* × *Haylockii* to illustrate the fact that reciprocal crosses are not always of precisely the same nature. *N.* × *Mansellii* is the result of the reciprocal cross in this case, but it differs in colour from *N.* × *Haylockii*. Dr. Keeble pointed out that such differences may arise because the pollen may not carry the chromoplasts. In addition to this, it is not certain that the same forms of the species were used in the making of both crosses, and if different forms were used the result would naturally be different.

Fertility of "green" Wallflower.—Prof. Henslow said that he found the fruits of this plant to contain numerous fertile seeds, but he had not been able to satisfy himself that the supernumerary carpels formed in place of stamens produced good seed.

Fasciation in Rose.—Mr. W. Patterson sent a fasciated branch of Rose from St. Vincent, W.I. He remarked that it had been taken from a bush which had been severely cut back. In his experience, fasciation was somewhat rare in Roses as compared with many other plants.

Pear with lateral proliferation.—Mr. Rogers, of Falmouth, sent a Pear which had produced a bud upon its side. This malformation is rather common and is due to the fact that the fleshy part of the Pear is a stem structure.

Macaranga saccifera.—Messrs. Veitch exhibited, on behalf of M. Louis Gentil, a plant of *Macaranga saccifera*, a native of the Congo district, belonging to the *Euphorbiaceae*, and possessing very curious saccate growths of the nature of stipules: a pair at the base of each leaf. The Committee, on the proposal of Mr. Bowles, seconded by Mr. Hales, unanimously recommended the award of a Botanical Certificate.

Plant breeding, &c.—The Rev. Prof. Henslow made some remarks upon the Mendelian phenomenon of segregation. He first drew attention to the fact that dissociation of the characters of the parent plants crossed—when the dominant offspring (F_1) was self-fertilized and bore offsprings usually like each parent (F_2)—often appeared in the first cross, so that this (F_1) was intermediate in characters, as of that of Primula sinensis ' Crimson King,' with a white (Star) ' Lady ' variety (Bateson's " Mendel's Principles of Heredity," Pl. vi.). Mendel's dissociations appear to be a previously unknown instance. Prof. Henslow gave as examples among hybrids the two species of *Petunia* with a purple or violet and white flower respectively, the offspring of which are mostly striped. *Cytisus Adami* is another case. Of crosses with floral or fruit dissociations he mentioned *Rhododendron* (*Azalea*) *indicum*, the York and Lancaster Rose, Sweet Williams, Chrysanthemums, Orchids, &c., and the fruit of Red and White Currants. Another cause of dissociation arose when naturally compound colours as orange and purple are crossed with a white variety. Thus the orange *Abutilon Darwinii* and *Rhododendron javanicum* have supplied reds and yellows. Now the question arises—When one parent is quite invisible and recessive in F_1, why is the other dominant? Judging from the examples given in Mr. Bateson's work, the answer is that the dominant characters are mostly, if not always, those representing the original specific type. Thus tallness of stems, round and yellow seeds, are dominant in the kitchen Pea. The purple and flat standards of the Sweet Pea are specific and dominant. In fruits, the normal and prickly forms of *Ranunculus arvensis* and of *Datura* are dominant. If, therefore, the species be known as the earliest varieties, such may be expected to supply the dominant characters.

He then read the following note on the influence of starvation on sex. In the note on this subject, read September 13 (p. ccxlvii), it was mentioned that in one of the 3½-inch pots there were 73 seedlings of *Mercurialis annua*. Of these, 39 proved to be males and 10 females on

August 20. All these were removed. Of the 24 left, 14 bore female flowers by September 23. Of the remaining 10, seven more proved to be also females by October 30. The three remaining died. Hence, the 21, when not crowded, developed only female flowers. In another experiment in a 6-inch pot there were 45 seedlings. Of these, 27 were males and 18 females, *i.e.* in the proportion of three to two. These plants grew much taller than in the smaller pots, the males being from nine inches to 12 inches in height, the females from four inches to six inches, whereas in the 3½-inch pot they flowered when only about four inches in height.

Scientific Committee, November 8, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Fruit of Musa ventricosa.—Mr. Worsdell, F.L.S., showed a fruit of a species of *Musa*, probably *M. ventricosa*, which he had collected in the Northern Transvaal, the plants growing in a grove on the edge of the forest just where it joins the high veldt.

Pollen of Apples, &c.—Mr. Hooper showed photographs of the pollen of several kinds of fruit trees and bushes.

Malformed Pears.—Mr. Bowles showed on behalf of Mr. Hooper Pearson some so-called proliferous Pears. This malformation is not uncommon, and is explained by the fact that the fleshy part of the Pear is an axial structure, not a part of the ovary. The terminal fruits are merely extensions of the axis without the formation of carpels.

Triple flower of Dendrobium formosum.—Mr. L. Crawshay made the following report on the flower referred to him from the last meeting: This flower was developed near the apex of an inflorescence bearing normal ones and was about half as large again in all parts. The normal flowers consist of six perianth segments, the petals much broader than the sepals, two of the latter, together with the labellum and column, being prolonged backwards to form a spur. The spur was complete posteriorly by the cohesion of the posterior margins of the lateral sepals, but was split almost to the apex anteriorly, on account of the corresponding margins of the lateral sepals being free. The abnormal flower showed five sepals and three petals, a double labellum and triple column, the middle third of which was smallest. It was formed of three flowers, the laterals being set nearly at right angles to the median one. Each lateral flower consisted of two complete sepals, two petals (one on the labellum), and a well-developed spur. Each also accounted for one-third of the column, and bore a normal pollen apparatus. The posterior petal (dotted in figure) showed traces of a dividing line, and represented the two contiguous petals of the lateral flowers, whilst the anterior sepal (lined in figure) similarly represented two lateral sepals. The only evidence of the median flower was in the ovary and the middle third of the column, which was barren.

Instead of the characteristic triangle, the ovary showed an oblong section, and only five placental areas had been differentiated. (Fig. 184.)

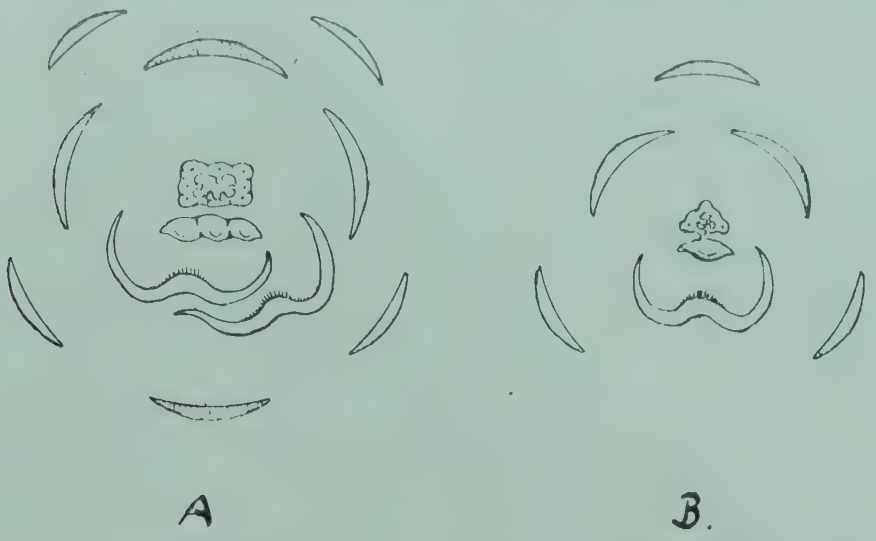


FIG. 184.—DIAGRAM OF TRIPLE FLOWER OF DENDROBIUM FORMOSUM (A), AND OF NORMAL FLOWER FOR COMPARISON (B).

Cheiranthus × *Arkwrightii*.—Mr. Arkwright wrote regarding this as follows: "Though a good many seed pods seemed to be growing all right for a long time, there is not a single seed to be found that looks as if it could possibly germinate." (See p. cxv.)

SCIENTIFIC COMMITTEE, NOVEMBER 22, 1910.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with six members present, and W. W. Pettigrew, visitor.

Pine seeds.—Mr. Douglas, V.M.H., drew attention to the sale of the seeds of *Pinus Pinea* under the name of "pignolia" in Bournemouth and elsewhere. They are used for flavouring, &c.

Gentiana Pneumonanthe forma alba.—Mr. Chittenden showed a white-flowered specimen of *G. Pneumonanthe*, found by Admiral Carr on Chobham Common. The plant was an exceedingly fine specimen of this species with white flowers; indeed, so floriferous was it (it bore eighteen almost, or quite, open flowers) that at first Mr. Chittenden could not believe it to be *G. Pneumonanthe* at all. Admiral Carr wrote: "The plant was found on Chobham Common, near this house, about two years ago, and is growing well in my garden. *Gentiana Pneumonanthe* is fairly common here. . . . A plant has been raised from seed of this wild one, also white." A white-flowered form is mentioned in "De Gentiana libellus" by Froelich, published in 1796, but no mention of its occurrence in Britain could be found in any of the floras consulted. If Admiral Carr succeeds in raising a stock of white-flowered plants, we shall have to thank him for adding a charming variety to those gardens where Gentians of this type succeed.

Scientific Committee, December 6, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and seven members present.

Fruits of Eucalyptus and Allied Plants.—Mr. Worsdell, F.L.S., showed the fruits of *Eucalyptus ficifolia*, in which they are quite simple; *E. cornuta*, where they are partially united; *Syncarpia*, where they are formed from five or six fused flowers; and *Agonis flexuosa*, where they are very densely aggregated. The fruits, which had been collected by Mr. Worsdell in South Africa, showed in an interesting fashion the variation in fruits which may be seen in nearly allied plants.

Stachys ambigua.—Mr. Fraser, F.L.S., showed specimens of this plant, a hybrid between *Stachys sylvatica* and *S. palustris*, and commented upon the characters wherein it differed from its parents.

Kale with Surface Outgrowths.—Mr. Bowles showed a leaf of Scotch kale from Mr. Cowan, of Penicuik, with outgrowths from its upper surface, somewhat like those often seen in cabbage, and termed ascidia. In the present case, however, the growths were fringed at their edges and considerably crisped.

Tar-water and Plants.—Mr. F. Kitley, of Bath, sent two coffee plants, one of which has been watered with tar-water a few times, the other not. The former showed much more vigorous growth, the latter had apparently not been quite equal to the former at the start and had been "stopped." While it is probable that tar-water would have some effect as was shown, the Committee thought the particular specimens were hardly comparable with one another.

Gynura cernua.—Mr. Chittenden showed flowers of this annual composite raised from seed received from British Central Africa.

Scientific Committee, December 20, 1910.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the chair, and two members present.

Araucaria Cunninghamii.—An inquiry was received from Mr. Rogers, of Launceston, as to whether shoots of this plant could be rooted. It was pointed out that while this could be done, lateral shoots when rooted rarely formed shapely plants, though shoots from near the top of the tree will do so.

FRUIT AND VEGETABLE COMMITTEE.

SEPTEMBER 9, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. A. DEAN, V.M.H., in the Chair, and six members present.

THE following plants from the trials were recommended for inspection of the full Committee at their next meeting:—

Potatos.—No. 14,* 'Chambers' Prima Donna'; No. 53, 'Lady Llewelyn'; No. 85, 'Dalmeny Early.'

Pea.—No. 230, 'Late Duke.'

Parsnips.—'Improved Hollow Crown,' 'New White Marrow,' 'Student.'

Melons.—No. 2. 'Mauldslie Castle'; No. 5. 'Tunbridge Green.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 13, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Bunyard, Maidstone, for a collection of fruit trees in pots.

Silver-gilt Knightian Medal.

To Messrs. Rivers, Sawbridgeworth, for a collection of Apples and Plums.

Silver Knightian Medal.

To C. T. Cayley, Esq., Tonbridge, for Grapes.
To Messrs. Clibrans, Altrincham, for a collection of Celery.
To Messrs. Paul, Waltham Cross, for fruit trees in pots.

Silver Banksian Medal.

To Mr. G. W. Miller, Wisbech, for Apples.

Cultural Commendation.

To Mr. W. Bannister, Bristol, for Pear 'Doyenné Boussoch.'
To Messrs. Clibrans, Altrincham, for strain of exhibition Parsley.

First-class Certificate.

To Apple 'Red Victoria' (votes, unanimous), from Mr. G. W. Miller, Wisbech. This variety received an Award of Merit on September 15, 1908. Fruit large, deep, round, slightly ribbed; very highly

* The numbers in brackets refer to the number given in the trial. See p. 672.

coloured, with minute spots of red; eye closed, set in deep-furrowed basin, segments long; stalk thin, very short, set in deep wide cavity; flesh white, very juicy. An early culinary variety. (Fig. 185.)

To Apple 'Rev. W. Wilks' (votes, unanimous), from Messrs. J. Veitch, Chelsea. This variety received an Award of Merit on September 20, 1904. Fruit very large, of fine form, creamy-yellow in colour, and sparsely covered with minute brown and scarlet dots, eye closed with long segments, set in a moderately deep basin slightly furrowed; stalk one inch long, thick, and deeply inserted in a wide, deep

FIG. 185.—APPLE 'RED VICTORIA.' (*Journal of Horticulture.*)

cavity, lined with russet; flesh white, juicy, and pleasantly flavoured; an excellent cooking apple. Raised from 'Peasgood's Nonesuch' × 'Ribston Pippin.' (Fig. 186.)

Award of Merit.

To Melon 'Mauldslie Castle' (votes, unanimous), from Messrs. Barr, Covent Garden. Fruit large, deep, round; skin, dark green, well netted; flesh thick, melting, and of exquisite flavour.

To Melon 'Tonbridge Green' (votes, unanimous), from Mr. W. Davies, Tonbridge. Fruit, very large; skin, greenish-yellow, slightly netted; flesh, deep, pale green, remarkably sweet and melting.

To Pea 'Late Duke' (votes, unanimous), from Messrs. Carter, High Holborn. See Report on Peas at Wisley, p. 725.

To Potato 'Chambers' Prima Donna' (votes, unanimous), from Mr. A. Chambers, Tunbridge Wells. See Report on Potatos at Wisley, p. 727.

To Potato 'Dalmeny Early' (votes, unanimous), from Messrs. Barr, Covent Garden. See Report on Potatos at Wisley, p. 728.

The following were highly commended (**XXX**) after trial at Wisley:—

Parsnips: 'Improved Hollow Crown,' 'New White Marrow,' 'Student,' all from Messrs. Barr, Covent Garden. (See p. 747.)

Fig. 186.—Apple Rev. W. Wilks. (*Garden.*)

Other Exhibits.

Mr. Atkins, Beckenham: Strawberry 'Atkins' Continuity.'
Mr. Moulton-Barrett, Calbourne: seedling Pear.
Mr. A. W. Chillery, Withycombe: Apple 'Marpool Beauty.'
Mr. Heep, Aldermaston: seedling Apple.
Messrs. Lane, Berkhamsted: Apple 'Dawson's seedling.'
Messrs. Palmer, London: Melon 'Grosvenor.'
J. Price, Esq., Knutsford: Apples.
Mr. W. West, Holt Hatch: Tomato 'King George V.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 27, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.
To the King's Acre Nurseries, Hereford, for fruit trees in pots.
To Mr. Stevenson, Addlestone, for Marrows and Gourds.
To Messrs. Sutton, Reading, for exhibit of uncommon vegetables.
To Messrs. Veitch, Chelsea, for vegetables.

Silver Banksian Medal.

To H.R.H. the Prince of Reuss, Gera, Germany, for preserving Cucumber 'Abundance.'
To Messrs. Massey, Spalding, for vegetables.
To Mr. W. E. Sands, Hillsborough, for Potatos.

Cultural Commendation.

To W. Gay, Esq., Higham, for Figs grown in the open.

Other Exhibits.

Mr. J. Bamford, Heanor: Apple, 'Bamford's Seedling.'
Church Army City Garden: Vegetable Marrow weighing 28 lbs.
Messrs. Harrison, Leicester: Cabbages.
Mrs. Perry, Ealing: Apple, 'Flowery Town.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 11, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for a collection of Apples.

Silver Banksian Medal.

To the Times Experimental Station, Guildford, for a collection of Radishes.

Other Exhibits.

Mr. H. Bird, Horringer Court: Melon seedling.
Mr. B. Clark, Mersham: Apple 'Best's Seedling.'
Mr. J. Crook, Camberley: Bean 'Hackwood Park Success.'
Mr. N. G. Jolliffe, Wootton, I.W.: seedling Apple.
Mr. W. Knight, Hailsham: Hailshamberry.
Mrs. Miller, Marlow: Syrups and Chutneys.
Mr. D. Monk, Chelmsford: Apple 'Chelmsford King.'
Rev. G. Whitehead, Bedale: Apple 'Pratt's Seedling.'
Mr. W. Wright, Woodford Green: Triple white Marrow.

FRUIT AND VEGETABLE COMMITTEE, BRITISH FRUIT SHOW, OCTOBER 13, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Award of Merit.

To Apple 'Hounslow Wonder' (votes, 14 for), from Messrs. Spooner, Hounslow. Fruit of medium size, flat round, yellow, but spotted and striped with red on the exposed side; stalk half-inch long, deeply inserted; eye open, in a moderate and rather puckered basin; calyx upright; flesh very crisp, and excellent for cooking. The tree is stated to be a great bearer.

To Peach 'Salwey' (votes, unanimous), from Duke of Richmond and Gordon (gr. Mr. Brock), Chichester. A well-known and popular late variety. Colonel H. Salwey brought from Sicily about fifty or sixty years ago a bag of peach stones and handed them over to Mr. C. Turner, Nurseryman, Slough, and 'Salwey' was raised from one of the stones. This information was supplied by Mr. T. Salwey, a descendant of Colonel Salwey.

Other Exhibits.

Messrs. Daniel, Norwich: seedling Raspberry.
Col. the Hon. G. Harbord, Norwich: Raspberry 'Alexander.'
Duke of Rutland, Grantham: Peach 'Duchess of York.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 25, 1910.

Mr. W. POUPART in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Medal.

To Messrs. Sutton, Reading, for a collection of vegetables.

Silver-gilt Knightian Medal.

To Messrs. J. Veitch, Chelsea, for a collection of vegetables.

Silver-gilt Banksian Medal.

To Mrs. G. Banks, 102 Park Street, W., for home-made preserves.

Silver Knightian Medal.

To Mr. W. R. Green, Wisbech, for a collection of Potatos.

Silver Banksian Medal.

To B. Broad, Esq., Putney Heath, for a collection of Apples.

Other Exhibits.

Right Hon. Earl Beauchamp (gr. Mr. Crump), Malvern: Apple 'Bromsberrow Seedling.'

Messrs. Dobbie, Edinburgh: Potatos and Parsley.

Messrs. Hartland, Cork: Apples.

Mr. A. K. Searl: Carrots.

Mr. Sheppard, Catford: Cauliflowers.

Mr. W. Wingfield, Nantwich: seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 8, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Award of Merit.

To Apple 'Ard Cairn Russet' (votes, unanimous) from Messrs. Hartland, Cork. Fruit medium in size, rather conical, with five dis-

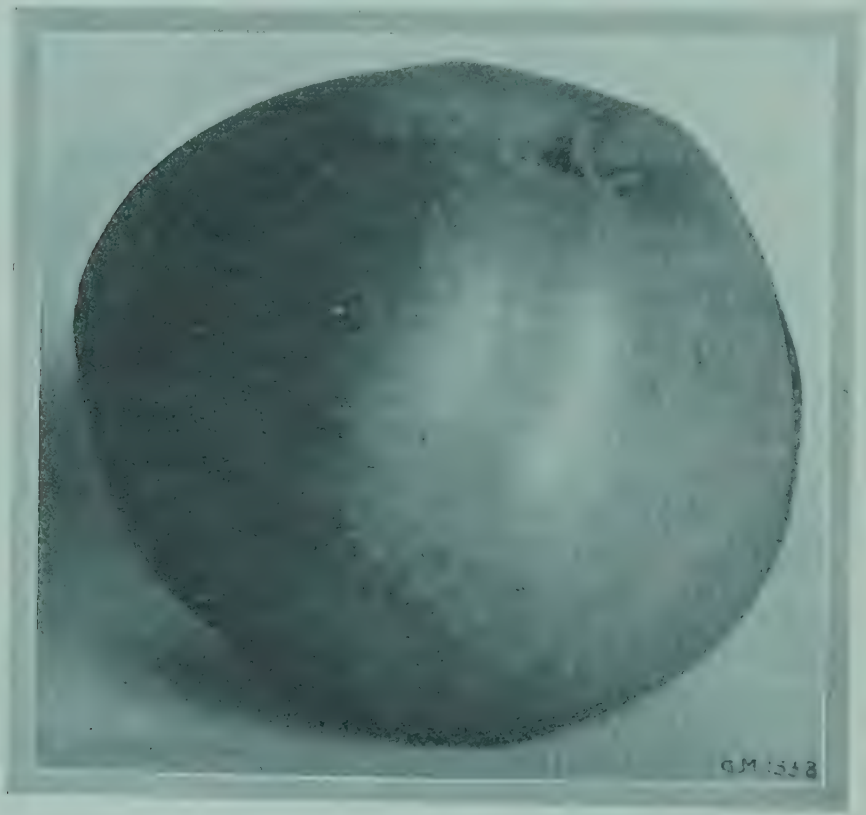


FIG. 187.—APPLE 'ARD CAIRN RUSSET.' (*Gardeners' Magazine.*)

tinct nodes round the eye; skin pale yellow, lightly flushed with red on the exposed side, and the whole fruit covered with a pale russet colour; eye closed, and with broad segments, set in a shallow puckered basin; stalk half-inch long, thin, set in a deep russety cavity; flesh crisp, juicy, and of very good flavour, and the fruit should keep till February. An excellent dessert variety. (Fig. 187.)

Other Exhibits.

Mr. E. W. Caddick, Ross: Apple 'Caradox Scarlet.'
G. E. Dyke, Esq., Milborne Port: seedling Apples.
Mr. H. Markham: Apple 'Ellisson Early Orange.'
Mr. F. M. Seabrook, Ramsey Abbey: Celery.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 22, 1910.

Mr. G. BUNYARD, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Silver-gilt Hogg Medal.

To Lieut.-Colonel A. C. Borton, Maidstone, for Apples.

Silver-gilt Knightian Medal.

To Mr. W. Poupart, Richmond, for bottled fruits.

Silver Knightian Medal.

To Lord Llangattock, Monmouth, for seedling Pines.

The following varieties of Endive from the trials at Wisley were highly commended (**XXX**):—

No. 4, 'Broad-leaved Batavian' (R. Veitch); No. 10, 'Green Curled' (R. Veitch); No. 26, 28, 'Round-leaved Batavian' (Sutton, J. Veitch); No. 27, 'Round-leaved Batavian Improved' (R. Veitch); No. 31, 33, 'White Curled' (Sutton, R. Veitch); No. 37, 'Toogood's Winter Giant' (Toogood).

For descriptions see Report on Salads at Wisley, 1910 (p. 732).

Other Exhibits.

R. Mathews Fisher, Esq., London, S.E.: seedling Apple.
Mr. W. Lintott, Woldingham: Grapes.
Mrs. S. Miller, Marlow: Preserves.
Mr. T. Mupon, Henfield: seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 6, 1910.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and fifteen members present.

No awards were recommended.

Exhibits.

Mr. B. Clark, Mersham: Apple 'Best's Seedling.'
Messrs. Hartland, Cork: Apple 'Ard Cairn Russet.'

* The numbers in brackets refer to the number given in the trial. See footnote p. 672.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 20, 1910.

Mr. J. CHEAL in the Chair, and six members present.

Dandelion 'Early Improved' from Messrs. J. Veitch, Chelsea, was highly commended (**XXX**) after trial at Wisley.

Dandelion 'Improved Broad-leaved' from Messrs. Barr, Covent Garden, was commended (**XX**) after trial at Wisley.

Other Exhibits.

Messrs. Carter, Raynes Park: Dandelion, 'Broad-leaved.'
Messrs. Sutton, Reading: Dandelions.
Messrs. Toogood, Southampton: Dandelions.
Mr. E. Trim, Chichester: Seedling Apple.

FLORAL COMMITTEE.

SEPTEMBER 13, 1910.

Mr. WILLIAM MARSHALL, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Medal.

To Messrs. Carter Page, London Wall, for Dahlias.

Silver-gilt Banksian Medal.

To Mr. F. Brazier, Caterham, for Phloxes.

Silver Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.
To Mr. Maurice Prichard, Christchurch, for hardy plants
To R. Fellows, Esq., Norwich, for Sweet Peas.
To Messrs. Paul, Waltham Cross, for Roses.

Silver Banksian Medal.

To Messrs. Bakers, Codsall, for Dahlias.
To Messrs. Dobbie, Edinburgh, for Marigolds, &c.
To Messrs. John Forbes, Hawick, for Pentstemons and Phloxes.
To Messrs. Jones, Lewisham, for Michaelmas Daisies.
To Messrs. May, Upper Edmonton, for Crotons and Ferns.
To Messrs. Veitch, Chelsea, for miscellaneous flowering plants.
To Mr. West, Brentwood, for Dahlias.
To Mr. L. R. Russell, Richmond, for Clematis.
To W. R. Hammond, Esq., Burgess Hill, for Sweet Peas.

Bronze Flora Medal.

To Messrs. Backhouse, York, for hardy plants.
To Mr. A. Ll. Gwillim, New Eltham, for Begonias.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Wells, Merstham, for Chrysanthemums, &c.
To Mr. Amos Perry, Enfield, for hardy plants.
To Messrs. Barr, Covent Garden, for hardy plants.

Award of Merit.

To Chrysanthemum 'Hollicot White' (votes, 10 for), from Mr. W. Roots, Cranford. A large early-flowering variety having flowers of pure white borne on good stiff stems.

To Chrysanthemum 'Hollicot Yellow' (votes, 12 for), from Mr. W. Roots, Cranford. A large early-flowering variety of a buttercup-yellow colour.

To Dahlia 'H. L. Brousson' (votes, 10 for, 3 against), from Messrs. Stredwick, St. Leonards. A useful bright rose-pink 'Cactus' variety. Flowers of medium size.

To Dahlia 'Cardinal' (votes, 7 for, 2 against), from Messrs. J. Cheal, Crawley. A bright red "single" variety having a yellow ring round the centre.

To Dahlia 'Loveliness' (votes, unanimous), from Mr. C. Turner, Slough. A "decorative" variety having large flowers of a very pleasing rosy pink. (Fig. 188.)

To Dahlia 'Loveliness' (votes, 10 for), from Mr. V. Seale, Sevenoaks. A "single" variety of a lilac-pink colour with a bright crimson ring round a yellow centre.

To Dahlia 'Minerva' (votes, 14 for), from Mr. C. Turner, Slough. A useful garden 'Cactus' variety of great decorative value.

To Dahlia 'Hon. Mrs. Greville' (votes, unanimous), from Messrs. J. Cheal, Crawley. An orange-yellow 'Cactus' variety suffused with salmon. The flowers are borne well above the foliage on very stiff stems, making it a very useful Dahlia for garden decoration and for cutting.

To Dahlia 'Mrs. Joynson Hicks' (votes, 11 for), from Messrs. J. Cheal, Crawley. A "single" Dahlia of a buff-yellow shade with a red ring round the centre.

To Dahlia 'Mrs. Landale' (votes, unanimous), from Messrs. J. Cheal, Crawley. A garden 'Cactus' variety with a yellowish ground, shading off to rose pink.

To Dahlia 'Ouida' (votes, 13 for), from Mr. V. Seale, Sevenoaks. A "single" variety of a curious bronzy orange colour, shading to lilac pink at the tips of the petals and to deep scarlet round a yellow centre.

To Dahlia 'Princess Juliana' (votes, 11 for, 1 against), from Messrs. Whitelegg & Page, Chislehurst. A useful ivory-white, Pæony-flowered variety.

To Dahlia 'Sweetbriar' (votes, 8 for, 1 against), from Messrs. J. Stredwick, St. Leonards. A large garden 'Cactus' Dahlia of a pleasing pale rose-pink colour.

To Gladiolus 'Rathline' (votes, 11 for), from Mr. W. C. Bull, Ramsgate. Flowers, large and of a beautiful cream shade, borne on spikes 2 feet long; base of petals slightly blotched with crimson.

Other Exhibits.

Messrs. Bath, Wisbech: Chrysanthemums.

J. T. Bennett-Poë, Esq., Cheshunt: *Olea fragrans rubra.*

Messrs. Cutbush, Highgate: miscellaneous plants.

Guildford Hardy Plant Nursery: hardy plants.

Sir Trevor Lawrence, Bart., V.M.H., Dorking: *Crinum purpurascens.*

Messrs. Low, Bush Hill Park: Carnations.

Mr. Mortimer, Farnham: Dahlias.

Mr. H. F. Robson, Ham: Chrysanthemums.

Mr. Shoesmith, Woking: Dahlias.
Messrs. R. Veitch, Exeter: Gladiolus 'Exonia.'
Messrs. Ware, Feltham: Dahlias and Asters.
Messrs. Whitelegg & Page, Chislehurst: Dahlias.

FLORAL COMMITTEE, SEPTEMBER 15, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. W. MARSHALL, V.M.H., in the Chair, and eight members present.

Awards Recommended:—

Award of Merit.

To Chrysanthemum 'Abercorn Beauty' (1,* 84), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Elaine' (122), from Messrs. Wells, Merstham.

To Chrysanthemum 'Flora' (253), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Leslie' (156), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Miss Balfour Melville' (172), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Mr. Selby' (260), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Nina Blick' (60), from Messrs. Dobbie, Edinburgh.

(For descriptions, see Reports of Wisley Trials, p. 672.)

To Dahlia 'Grenadier' (16), from Messrs. Hobbies, Dereham.

To Dahlia 'Hohenstaufen' (37), from Mr. Pfitzer, Stuttgart.

To Dahlia 'S. T. Wright' (107), from Messrs. Bakers, Codsall.†

FLORAL COMMITTEE, SEPTEMBER 27, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-nine members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. Ware, Feltham, for Begonias and Michaelmas Daisies.

Silver-gilt Banksian Medal.

To Mr. J. Box, Lindfield, for hardy plants.

To Messrs. Carter Page, London Wall, for Dahlias.

* The numbers in brackets refer to the number in the trial. See footnote, p. 672.

† Dahlia 'S. T. Wright' was seedling No. 189 and was lebelled 107 in the trial. See Report on Dahlias, R.H.S. JOURNAL, vol. xxxv. part iii., p. 429.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias.
To Messrs. Jones, Lewisham, for Michaelmas Daisies.
To Messrs. McGredy, Portadown, for Roses.
To Mr. L. R. Russell, Richmond, for Clematis, etc.
To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Mr. F. Brazier, Caterham, for hardy plants.
To Messrs. Bunyard, Maidstone, for hardy plants.
To Messrs. Clark, Dover, for hardy plants.
To Messrs. Cutbush, Highgate, for hardy cut flowers.
To Messrs. S. Low, Bush Hill Park, for Carnations.
To Messrs. May, Upper Edmonton, for flowering plants and Ferns
To Messrs. Paul, Cheshunt, for cut foliage.
To Mr. G. Prince, Oxford, for Roses.
To Messrs. Wells, Merstham, for Chrysanthemums and Carnations.
To Mr. J. T. West, Brentwood, for Dahlias.

Bronze Flora Medal.

To Messrs. Bath, Wisbech, for Chrysanthemums and Asters.
To Mr. F. Lilley, Guernsey, for Lilies and Nerines.

Bronze Banksian Medal.

To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. H. F. Robson, Ham, for Chrysanthemums, etc.

First-class Certificate.

To *Viburnum Henryi* (votes, unanimous), from Messrs. Veitch, Chelsea. A choice hardy evergreen shrub from Western China, having lanceolate glossy green leaves 3 to 5 inches long and 1 to 1½ inches broad, with a serrate margin and prominent yellow midrib. The plant shown was carrying a large crop of coral-red fruits borne in panicles which were very ornamental. (Fig. 189.)

Award of Merit.

To Aster ' Peggy Ballard ' (votes, 16 for), from Mr. Ernest Ballard, The Court, Colwall, Malvern. A beautiful, free-flowering, double Aster having bright violet flowers about three-quarters of an inch in diameter.

To Carnation ' Lady Alington ' (votes, unanimous), from Messrs. Stuart Low, Bush Hill Park. A seedling perpetual-flowering Carnation obtained by crossing ' Britannia ' with ' White Perfection.' It is of a very rich salmon-pink colour; of good size; and has a very strong clove scent. The centre of the flower is very full and the petals are much crinkled. The calyx was good in most of the blooms exhibited.

To Chrysanthemum ' Betty Spark ' (votes, 10 for, 4 against), from Mr. W. Roots, Cranford. A very pretty violet-rose Chrysanthemum bearing flowers of good size in great profusion.

To Chrysanthemum 'Hollicot Golden' (votes, 15 for), from Mr. W. Roots, Cranford. A very large full-flowered Chrysanthemum of

Fig. 189.—Viburnum Henryi. (*Veitch.*) (P. cclxvi.)

a golden-yellow colour. The stems and large healthy foliage showed signs of a vigorous constitution.

To Chrysanthemum 'Hollicot Pearl White' (votes, 14 for, 1 against), from Mr. W. Roots, Cranford. A magnificent creamy-white Chrysanthemum of good substance.

To Dahlia 'Flagstaff' (votes, 16 for), from Messrs. Stredwick, St. Leonards. A large 'cactus' variety of a rosy-salmon colour. The flowers are borne well above the foliage on strong stems.

To *Lobelia cardinalis* 'Gloire de St. Anne's' (votes, 10 for 4 against), from Lady Ardilaun, Clontarf, Co. Dublin. A great improvement on the type, having large flowers of a rich velvety carmine-red. The spikes shown were very large and showed remarkable vigour of growth.

To Phlox 'Ellen Willmott' (votes, 12 for, 3 against), from Messrs. Gunn, Olton. A beautiful late-flowering Phlox of a pale ageratum-blue colour with a lighter zone round the eye. The flowers are nearly 1½ inch in diameter and are borne in large trusses. The plant is said to be tall and a strong grower.

To Rose 'Dorothy Ratcliffe' (votes, unanimous), from Messrs. McGredy, Portadown, Ireland. A beautiful new seedling Hybrid Tea Rose of good substance. Colour: rosy-pink shading to buff.

To Rose 'Ethel Malcolm' (votes, unanimous), from Messrs. McGredy, Portadown, Ireland. An ivory-white Hybrid Tea Rose with a delicate peach shading in the centre of the bloom. The flowers are large, full, and of great substance and delicately scented. The foliage is very distinct, being very dark green.

To Rose 'Mrs. Herbert Stevens' (votes, unanimous), from Messrs. McGredy, Portadown, Ireland. A new seedling Tea Rose having long, pointed white blooms with a distinct fawn and peach shading towards the centre. It has a delightful perfume and is said to be very hardy, having withstood over 30 degrees of frost without the slightest injury. It is a perpetual-blooming variety, and the growth of the bushes is remarkably vigorous.

To *Solidago spectabilis* (votes, unanimous), from Messrs. G. Paul, Cheshunt. A useful chrome-yellow species about 2 feet in height; very free flowering.

Other Exhibits.

Messrs. Bakers, Codsall: hardy plants.
Canon Jephson, Welwyn: Dahlia 'George Freeman.'
Messrs. B. R. Cant, Colchester: Roses.
Messrs. F. Cant, Colchester: Roses.
Messrs. Crisp, Colchester: Roses.
Mr. E. Edwardes, Southampton: Cactus Dahlias
Mr. Gwillim, New Eltham: Begonias.
Misses Hopkins, Shepperton: hardy plants.
Mr. S. Mortimer, Farnham: Dahlias.
Mr. Amos Perry, Enfield: hardy plants.
Mr. J. B. Riding, Chingford: Dahlias.
Mr. Shoesmith, Woking: Dahlias.

FLORAL COMMITTEE, SEPTEMBER 29, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. W. MARSHALL, V.M.H., in the Chair, and eight members present.

Awards Recommended:—

Award of Merit.

To Chrysanthemum 'Cecil Wells' (96*), from Messrs. Wells, Merstham.

To Chrysanthemum 'Diana' (15), from Messrs. Dobbie, Edinburgh, and Messrs. Wells, Merstham.

To Chrysanthemum 'Fée Japonaise' (128), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Gatton' (135), from Messrs. Wells, Merstham.

To Chrysanthemum 'Market White' (46), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Mrs. A. Thomson' (54), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Perle Chatillonaise' (200), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Polly' (68), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Provence' (208), from Messrs. Dobbie, Edinburgh.

To Chrysanthemum 'Tapis de Neige' (76), from Messrs. Dobbie, Edinburgh.

For descriptions, see Reports of Wisley Trials, p. 672.

FLORAL COMMITTEE, OCTOBER 11, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Gold Medal.

To Mr. L. R. Russell, Richmond, for Bamboos.

To Messrs. Veitch, Chelsea, for Chinese shrubs and other ornamental plants.

Silver-gilt Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.

To Hon. Vicary Gibbs, Elstree, for Asters.

Silver-gilt Banksian Medal.

To Messrs. Hill, Lower Edmonton, for Gleichenias.

To Messrs. Jones, Lewisham, for Asters.

* See footnote, p. cclxv.

Silver Flora Medal.

To Mr. F. Brazier, Caterham, for hardy plants.

To Messrs. Carter Page, London Wall, for Dahlias.

To Messrs. Cheal, Crawley, for autumn foliage and flowering shrubs.

FIG. 190.—CARNATION 'SCARLET GLOW.' (*Lange.*) (P. cclxxii.)

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. W. Paul, Waltham Cross, for berry-bearing shrubs and hardy plants.

Fig. 191.—Carnation 'Shasta.' (*Lange*,) (P. cclxxii.)

To Messrs. Wells, Merstham, for Chrysanthemums, Asters, and Carnations.

Silver Banksian Medal.

To Adeline Duchess of Bedford (gr. Mr. Dickson), Chenies, for a group of *Gesnera* 'Orange King.'

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for Dahlias.

To Messrs. Cutbush, Highgate, for cut flowers, Carnations, Oranges, and other plants.

To Messrs. S. Low, Bush Hill Park, for Carnations.

To Messrs. May, Upper Edmonton, for Begonias, &c.

To Mr. H. F. Robson, Ham, for Chrysanthemums.

To Messrs. T. S. Ware, Feltham, for Dahlias.

Bronze Flora Medal.

To Messrs. Bakers, Codsall, for Dahlias.

To Messrs. Clark, Dover, for hardy plants.

Award of Merit.

To *Aster ericoides* 'Perfection' (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. Beckett), Elstree. A good variety of this very pretty species bearing large masses of small white flowers.

To Carnation 'Scarlet Glow' (votes, unanimous), from Mr. G. Lange, Hampton, and Messrs. S. Low, Bush Hill Park. A brilliant scarlet, perpetual-flowering variety of good substance, and having a good calyx. (Fig. 190.)

To Carnation 'Shasta' (votes, 12 for, 2 against), from Mr. G. Lange, Hampton. A white, perpetual-flowering variety, having the petals much fringed and a very strong clove scent. (Fig. 191.)

To Carnation 'White House' (votes, 15 for), from Messrs. Wells, Merstham. A perpetual-flowering variety from America. Flowers, pure white; very large; strongly clove-scented. The flower stems are very stiff, and the calyx does not split. (Fig. 192.)

To Chrysanthemum 'Cranfordia' (votes, 8 for, 2 against), from Mr. W. Roots, Cranford. A large market Chrysanthemum of a very rich yellow colour.

To Chrysanthemum 'Mary Poulton' (votes, 8 for, 2 against), from Mr. H. Poulton, Tunbridge Wells. A very large Japanese Chrysanthemum of a pale lilac-rose colour.

To Chrysanthemum 'Miss F. Collier' (votes, 12 for, 1 against), from Mr. W. Roots, Cranford. A large white market Chrysanthemum of very vigorous habit.

To *Gesnera* 'Orange King' (votes, unanimous), from Adeline Duchess of Bedford, Chenies. A seedling from mixed seed saved from *G. cinnabarina* and *G. exoniensis*. Colour, bright orange red; leaves mottled with dark green and red. The plants, which were about 15 inches in height, had been grown in a cold frame after having been started in a little heat.

To *Ligustrum Henryi* (votes, unanimous), from Messrs. J. Veitch, Chelsea. A neat and attractive evergreen shrub with glossy, dark

green ovate leaves. The foliage is small, and the habit of growth compact.

To *Symphoricarpus occidentalis* (votes, unanimous), from Messrs. J.

Fig. 192.—Carnation 'White House.' (*Gardeners' Magazine.*) (P. cclxxii.)

Veitch, Chelsea. A native of California, bearing clusters of very attractive white berries.

Other Exhibits.

Mr. W. A. Cook, Horsham: *Bignonia* 'Mme. Salen.'
Messrs. Crisp, West Bergholt: Roses.
Mr. J. Ellis, Walsall: Chrysanthemums.
F. Godding, Esq., Hanworth: Carnations.
Misses Hopkins, Shepperton: hardy plants.
Mr. C. Jennings: Chrysanthemum 'Mrs. C. Jennings.'
Lady Church, Hatfield: Cyclamen 'Lady Church.'
Mr. Mortimer, Farnham: Dahlias.
Messrs. Peed, Streatham; hardy plants.
Mr. M. Prichard, Christchurch: hardy plants.
Mr. Reuthe, Keston: hardy plants.
Mr. Riding, Chingford: Dahlias.
Mr. Silsbury, Shanklin, I.W.: Chrysanthemums.
Messrs. Stredwick, St. Leonards: Chrysanthemums.
Mrs. Stuart, Bideford: *Callistephus chinensis.*
Mr. West, Brentwood: Dahlias.

FLORAL COMMITTEE, OCTOBER 18, 1910.

SUB-COMMITTEE AT WISLEY.

Mr. W. MARSHALL, V.M.H., in the Chair, and five members present.

The following Chrysanthemums were recommended for the inspection of the full Committee at their next meeting:—

'Bouquet Rose' (93*); 'Crimson Queen' (14); 'Eden' (118); and 'October Gold' (62), from Messrs. Dobbie, Edinburgh.

'Freedom' (134); 'Mrs. Tom White' (181); 'Snowstorm' (221); and 'Wells' Scarlet' (178), from Messrs. Wells, Merstham.

For descriptions, see Report of Wisley Trials, p. 672.

FLORAL COMMITTEE, OCTOBER 25, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for Nepenthes and Stove plants.†

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for Asters, Carnations, and other plants.

To Lady Tate (gr. Mr. Howe), Streatham Common, for Ferns.

* See footnote, p. cclxv.

† This exhibit was recommended for the Lawrence Medal, which is awarded in December.

Silver-gilt Banksian Medal.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. J. Veitch, Chelsea, for Begonias, Chrysanthemums, &c.

Silver Banksian Medal.

To Messrs. Bakers, Codsall, for Dahlias.
To Mr. F. Brazier, Caterham, for hardy plants.
To Messrs. Cheal, Crawley, for Dahlias.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. May, Edmonton, for Ferns and Begonias.
To Mr. L. R. Russell, Richmond, for berried shrubs, &c.
To Mr. F. Lilley, Guernsey, for Nerines.

Bronze Flora Medal.

To Messrs. Stuart Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants.

Award of Merit.

To Aster ' Novelty ' (votes, 19 for), from Mr. F. Brazier, Caterham. A variety raised by Mr. E. Beckett, Elstree, having large numbers of pale lavender flowers with a suffusion of pink, which are borne on long tapering stems. It is said to grow 4½ feet in height.

To Carnation ' Regina ' (votes, 14 for), from Mr. C. Engelmann, Saffron Walden. A large, salmon-pink, perpetual-flowering variety, with serrated petals. The flowers are borne on long stout stems, and the calyx does not readily split. (Fig. 193.)

To Chrysanthemum ' Bouquet Rose ' (votes, unanimous), from Messrs. Dobbie, Edinburgh. For description see p. 677.

To Chrysanthemum ' Crimson Queen ' (votes, unanimous), from Messrs. Dobbie, Edinburgh. For description see p. 678.

To Chrysanthemum ' Eden ' (votes, unanimous), from Messrs. Dobbie, Edinburgh. For description see p. 678.

To Chrysanthemum ' Freedom ' (votes, unanimous), from Messrs. Wells, Merstham. For description see p. 680.

To Chrysanthemum ' Hilda Blick ' (votes, unanimous), from Mr. C. Blick, Hayes, Kent. A new seedling decorative variety having pure white flowers 3½ inches in diameter. The stems are remarkably stiff, and the petals quilled.

To Chrysanthemum ' J. H. Greswolde Williams ' (votes, 11 for, 2 against), from Messrs. Wells, Merstham. A good new single variety, having large broad yellow petals. The flowers are 4-5 inches in diameter.

To Chrysanthemum ' Joan Edwards ' (votes, 15 for, 5 against), from Mr. Philip Ladds, Swanley. A single variety, with rose-coloured petals and a prominent golden centre.

To Chrysanthemum 'Miss Mary Pope' (votes, 12 for), from Mr. F. Brazier, Caterham. A blush pink single variety. Florets drooping at the tips and contrasting pleasingly with the fine yellow disc.

FIG. 193.—CARNATION 'REGINA.' (*Engelmann.*) (P. cclxxv.)

To Chrysanthemum 'Mr. G. C. Kelly' (votes, 13 for), from Messrs. Wells, Merstham. A large rosy-crimson Japanese variety with a silver-grey reverse. The blooms were about 8 inches in diameter.

To Chrysanthemum 'Mrs. Sam Nash' (votes, 11 for, 2 against), from Messrs. Wells, Merstham. A good, free-flowering, rose-pink single, having flowers of medium size.

To Chrysanthemum 'Mrs. Tom White' (votes, unanimous), from Messrs. Wells, Merstham. For description see p. 683.

To Chrysanthemum 'Mrs. Tresham Gilbey' (votes, unanimous), from Mr. M. T. Ward, Bishop Stortford. A single variety said to be a sport from 'Bronze Pagram.' Flowers large, having three or four rows of very clear yellow florets.

To Chrysanthemum 'October Gold' (votes, unanimous), from Messrs. Dobbie, Edinburgh. For description see p. 684.

To Chrysanthemum 'Snowstorm' (votes, unanimous), from Messrs. Wells, Merstham. For description see p. 686.

To Chrysanthemum 'Wells' Scarlet' (votes, unanimous), from Messrs. Wells, Merstham. For description see p. 687.

To Croton 'Golden Ring' Lynwood var. (votes, unanimous), from A. E. Bainbridge, Esq. (gr. Mr. T. Bell), Lynwood, Newcastle-on-Tyne. Leaves long, crinkled, twisted, green and golden-yellow, with a tinge of pink on the under side. This variety is more compact in habit and the leaves are narrower and rather more drooping than in the type.

To *Nepenthes* × *nobilis* (votes, 6 for, 1 against), from Messrs. J. Veitch, Chelsea. A cross between *N. sanguinea* and *N. Curtisii superba*, having very large pitchers, the biggest of which was 14 inches long. There are dark red mottlings on the upper part of the pitchers on a lighter red ground which gradually shades to green at the base. The wings are prominent and beautifully fringed. The plant exhibited carried ten splendidly developed pitchers. (Fig. 194.)

To *Nerine* × *elegantissima* (votes, unanimous) from Mr. F. Lilley, Guernsey. A beautiful cerise-pink variety, having heads of from eight to ten large flowers. Seedling from *N.* × *Mansellii*.

Other Exhibits.

R. Barclay, Esq., Dorking: Chrysanthemums.

Messrs. Carter, High Holborn: Dahlia 'Raynes Park Gem.'

Messrs. W. Crisp, West Bergholt: Roses.

Hon. Vicary Gibbs, Elstree: Asters and *Broussonetia papyrifera cucullata*.

Mr. A. Noad, Cardiff: seedling Chrysanthemums.

Mr. Perkins, Henley-on-Thames: Chrysanthemum 'Margaret Smith.'

Mr. G. Reuthe, Keston: hardy plants.

Leopold de Rothschild, Esq., Acton: *Stapelia gigantea*.

State Botanical Gardens, Brussels: *Palisota Regis Albertii*, *Palisota Reginae Elisabethae*, *Macaranga saccifera*, *Pollia condensata* var. *variegata*, *Dorstenia yambuyaensis*. All these are new plants from the Congo district.

Messrs. Stredwick, St. Leonards: Chrysanthemums.

Miss B. M. Tyson, Dalton-in-Furness: Chrysanthemum 'Bianca.'

Edward Voisin, Esq., Jersey: Hydrangea 'Otaksa,' and H. 'Thomas Hogg.'

Messrs. Williams, Cardiff: Chrysanthemums.

FLORAL COMMITTEE, NOVEMBER 8, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended:—

Gold Medal.

To Messrs. Hill, Lower Edmonton, for a group of Ferns.

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for Begonias and Chrysanthemums.

Silver-gilt Banksian Medal.

To Messrs. May, Upper Edmonton, for British Polypodiums and Begonias.

Silver Flora Medal.

To Messrs. Carter Page, London Wall, for Chrysanthemums.

To Messrs. Cutbush, Highgate, for Carnations, &c.

Silver Banksian Medal.

To Frank Galsworthy, Esq., Chertsey, for flower paintings.

To Messrs. Peed, Norwood, for Chrysanthemums.

To Mr. L. R. Russell, Richmond, for hardy shrubs.

Bronze Flora Medal.

To Messrs. Stuart Low, Bush Hill Park, for Carnations.

Award of Merit.

To Carnation 'Mrs. C. W. Ward' (votes, 19 for, 1 against), from Mr. G. Lange, Hampton. An American perpetual-flowering variety; flowers full, of good size, deep cerise in colour; petals broad, serrated at the edges; calyx good; stems stiff and strong. The variety is said to be a vigorous grower and the colour is seen to great advantage under artificial light.

To Chrysanthemum 'Mrs. Frank Hill' (votes, 23 for), from Messrs. Geo. Williams, Cardiff. A violet-rose single Chrysanthemum, about 3 inches in diameter, with a prominent golden-yellow centre surrounded by a zone of white. The variety is said to grow 3½ feet in height and to be bushy in habit.

To Chrysanthemum 'Victorian' (votes, 10 for, 1 against), from Messrs. J. Stredwick, St. Leonards. A Japanese variety, 6 inches in diameter, having the florets of a peach-red colour, shading to bright yellow at the base with a yellowish buff reverse.

Other Exhibits.

R. Barclay, Esq., Dorking: Chrysanthemums.

W. B. M. Bird, Esq., Chichester: Chrysanthemum 'Mrs. Wm. Bird.'

Messrs. Cannell, Swanley: Pelargonium 'Salmon Paul Crampel.'

Messrs. Coldrum, 11 Sloane Street: flower vases.
Mr. J. H. Coley, Derby: Chrysanthemum 'Elsie Robinson.'
Mr. J. W. Cooper, Uppingham: Chrysanthemums.
R. French, Esq., Torquay: Chrysanthemums.
Mr. J. Godber, Bedford: Chrysanthemum 'Toison d'Or.'
Mrs. E. Higham, Addlestone: Chrysanthemum 'Mrs. Edward Higham.'
J. B. Nichols, Esq., Holmwood: Chrysanthemums.
Messrs. Price and Fife, Lee: Chrysanthemums.
Mr. G. Reuthe, Keston: hardy plants.
Messrs. Wells, Merstham: Chrysanthemums.
Mr. W. Wood, Dartford: Chrysanthemums.

FLORAL COMMITTEE, NOVEMBER 22, 1910.

Mr. W. MARSHALL, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To E. H. Brown, Esq. (gr. Mr. Bradford), Roehampton, for a group of winter flowering and foliage plants.

To the Rt. Hon. Lord Hillingdon (gr. Mr. Allan), Uxbridge, for Begonias.

To Messrs. Jones, Lewisham, for Chrysanthemums.

To Messrs. J. Veitch, Chelsea, for Chrysanthemums and winter-flowering Begonias.

Silver-gilt Banksian Medal.

To Messrs. May, Upper Edmonton, for *Nephrolepis.*

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Pelargoniums and Chrysanthemums.

To Messrs. Cutbush, Highgate, for Carnations and miscellaneous plants.

To J. Gurney Fowler, Esq. (gr. Mr. Davis), South Woodford, for Begonias.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To R. Foster, Esq. (gr. Mr. Elvy), Lindfield, for Begonias.

To Mr. W. H. Page, Hampton, for Pelargoniums.

To Mr. L. R. Russell, Richmond, for hardy shrubs.

Bronze Banksian Medal.

To the Rt. Hon. Lord Stanhope (gr. Mr. Sutton), Sevenoaks, for *Plumbago rosea.*

Award of Merit.

To Chrysanthemum 'Brightness' (votes, unanimous), from Messrs. G. Williams, Cardiff. A single variety having a single row of ray florets of a bright brick-red colour. The flowers are 4 inches across and the prominent centre is surrounded by a zone of yellow.

To Chrysanthemum 'Crimson Jewel' (votes, 14 for), from Messrs. Wells, Mersham. A single variety with several rows of reddish-crimson ray florets tipped with yellow. A yellow zone surrounds the prominent centre. The flowers are about 4½ inches in diameter.

To Chrysanthemum 'D. B. Crane' (votes, 10 for), from Mr. Silsbury, Shanklin, I.W. A Japanese Chrysanthemum of a deep golden yellow colour about 7 inches in diameter; florets broad, long, and curled.

To Chrysanthemum 'Ernest G. Mocatta' (votes, 10 for), from Mr. T. Stevenson, Addlestone. A Japanese variety of great size and substance and of a bright canary-yellow colour. It is a sport from 'Edith Jameson.'

To Chrysanthemum 'Ethel Thorp' (votes, 9 for, 3 against), from Mr. H. A. Thorp, Worthing. A good exhibition incurved variety of a rose-pink colour. The flowers are 6 inches across and 5 inches deep, and are borne on very strong stems.

To Chrysanthemum 'Mrs. Foot' (votes, 13 for, 1 against), from Mr. L. Lawrence, Shoreham. A single variety having a double row of deep reddish-violet ray florets. The flowers are 3¼ inches across and a zone of white surrounds a bright yellow centre.

To Chrysanthemum 'Peter Plant' (votes, 14 for), from Mr. L. Lawrence, Shoreham. Flowers 3½ inches across, having three rows of broad violet-rose ray florets; centre small.

To Chrysanthemum 'Sandown Radiance' (votes, unanimous), from Messrs. Wells, Merstham. A large single variety of a deep chestnut-crimson colour. The flowers are 5 inches in diameter.

To Chrysanthemum 'Strawberry' (votes, 13 for), from Mr. F. Lilley, Guernsey. A single variety with reddish terra-cotta flowers of medium size, which are borne in good sprays very suitable for cutting.

To Chrysanthemum 'William Turner' (votes, 17 for), from Messrs. Wells, Merstham. A Japanese variety of great size and good substance; colour pure white.

Other Exhibits.

Messrs. Bath, Wisbech: Chrysanthemum 'Violet Brace.'

Mr. J. Box, Lindfield: Chrysanthemums.

Mr. W. Camm, Taplow: Chrysanthemum 'Mrs. W. Astor.'

Mr. J. W. Cooper, Uppingham: single Chrysanthemums.

E. E. Curtis, Esq., Elwell: seedling Chrysanthemum.

G. Ferguson, Esq., Weybridge: Chrysanthemum 'Mrs. G. Ferguson.'

Misses Hopkins, Shepperton: hardy plants.

Mr. P. Ladds, Swanley: Chrysanthemums.
Messrs. S. Low, Bush Hill Park: Carnations.
G. Mileham, Leatherhead: Chrysanthemum 'Harry Mann.'
Mr. R. Murray, Bonchurch: Chrysanthemum 'G. B. Stern.'
Mr. V. Slade, Taunton: Pelargoniums.
E. Weber, Esq., Barnet: seedling Chrysanthemums.
West Somerset Nursery Co., Bridgwater: Chrysanthemums.

FLORAL COMMITTEE, DECEMBER 6, 1910.

Mr. H. B. MAY in the Chair and twenty-seven members present

Awards Recommended:—

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for Begonias and Ferns.
To Messrs. Rochford, Turnford Hall Nurseries, for Begonias.
To Messrs. J. Veitch, Chelsea, for Begonias and Chrysanthemums.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for cut flowers and decorative plants.
To Mr. L. R. Russell, Richmond, for hardy shrubs.
To Messrs. Wells, Merstham, for Chrysanthemums.

Bronze Banksian Medal.

To Miss Farrer, Burlington Gardens, for flower pictures.
To Miss Ough, Streatham Common, for flower pictures.

Award of Merit.

To Begonia 'Gloire de Lorraine' var. 'Rochfordii' (votes, unanimous), from Messrs. T. Rochford, Broxbourne. A pale crimson-pink sport from B. 'Gloire de Lorraine.' The flowers are nearly 1½ inch across and are produced in great profusion.

To Chrysanthemum 'Lady Furness' (votes, 13 for, 5 against), from Messrs. Wells, Merstham. A single variety of a pale rouge sang-dragon colour; flowers 4 inches in diameter. The prominent golden-yellow centre is surrounded by a zone slightly paler than the prevailing colour of the ray florets. The stems are stiff and erect and hold the blooms well above the foliage.

To Chrysanthemum 'Mrs. Gilbert Drabble' (votes, unanimous), from Messrs. Wells, Merstham. A creamy-white Japanese variety of great size and substance; the blooms were 8 inches across.

Other Exhibits.

Mr. W. J. Barnes, Windsor: Chrysanthemum 'W. Fox Pitt.'
F. W. Greswolde Williams, Esq., Bromyard: Chrysanthemums.
Misses Hopkins, Shepperton: hardy plants.
Mr. F. Lilley, Guernsey: Chrysanthemums.

Baron Bruno Schröder, Egham: Chrysanthemum 'Baroness Emma Schröder.'

G. Scourfield, Esq., Neath: Chrysanthemums.

Mr. H. Stevens, Sidmouth: Violet 'Askania.'

The Jamaica Agency, Holborn, E.C.: Cacti from Jamaica.

M. Toeffaert, Destelbergen: Begonias.

Mr. W. H. Young, Romford: Chrysanthemum 'White Winter Cheer.'

FLORAL COMMITTEE, DECEMBER 20, 1910.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

No awards were recommended.

Exhibits.

Mr. A. Card, New Malden: *Primula sinensis* 'Mrs. Morse.'

Mr. W. F. Hamilton, Lymington: Amaryllis 'Hon. Mrs. Whitaker.'

Messrs. Wells, Merstham: Chrysanthemum 'Peter Barnes.'

Mr. H. Woolman, Shirley: Chrysanthemum 'Shirley Beauty.'

ORCHID COMMITTEE.

SEPTEMBER 13, 1910.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Sander, for hybrids and rare species.

Silver Flora Medal.

To H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. G. E. Day), for Cattleyas, Laeliocattleyas, &c.

To Messrs. Stuart Low, Bush Hill Park, for a group.

To R. G. Thwaites, Esq., Streatham (gr. Mr. J. M. Black), for new Cochliodas, &c.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Mansell and Hatcher, Rawdon, Yorks, for a group.

Silver Banksian Medal.

To Mr. E. V. Low, Haywards Heath, for hybrid Cattleyas and Cypripediums.

First-class Certificate.

To *Cattleya* × 'Iris' var. 'King Edward VII' (*bicolor* × *Dowiana aurea*) (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). A large flower, with apple-green sepals and petals, changing to apricot, and broad amethyst-purple lip. (Fig. 195.)

To *Laeliocattleya* × 'Berthe Fournier' *magnifica* (*L.-c.* × *elegans* × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Differing from other forms in the labellum, which partakes most of *L.-c.* × *elegans*. Sepals and petals reddish-rose, with golden tint; lip bright ruby-red. (Fig. 196.)

Award of Merit.

To *Cypripedium* × 'Angela' (*niveum* × *Fairrieanum*) (votes, unanimous), from Mrs. Norman Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman). A compact white flower, with dotted lines of purple on the sepals, petals, and lip; staminode dark green.

To *Odontioda* × *Ceciliae* (*C. Noezliana* × *O.* × *Wiganianum*) (votes, 10 for, 2 against), from R. G. Thwaites, Esq. (gr. Mr. J. M. Black). A distinct hybrid, with cream-coloured flowers spotted with Indian red, the side lobes of the lip having red blotches.

To *Cattleya* × 'Adula,' Thwaites' variety (*bicolor* × *Hardyana*) (votes, unanimous), from R. G. Thwaites, Esq. Flowers tinted rosy lilac; lip ruby-purple, the centre being the darker; base orange.

Botanical Certificate.

To *Bulbophyllum polyblepharis*, from Sir Trevor Lawrence, Bart., K.C.V.O., for a fine specimen of *Dendrobium Hookerianum* (*chrysotis*). Guinea, of the habit of the dwarf *Pleurothallis*. Flowers single on slender stems, nearly an inch in length, the sepals extended perpendicularly; petals small, lip projected, slender, densely hairy, all dark purple.

Cultural Commendation.

To Mr. W. H. White, orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for a fine specimen of *Dendrobium Hookerianum* (*chrysotis*), its tall slender stems bearing a dozen sprays of large yellow, fringed-lipped flowers.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: orchid hybrids.
Sir Jeremiah Colman, Bart., V.M.H.: rare orchids.
Sir Trevor Lawrence, Bart., K.C.V.O.: *Stanhopea Rodigasiana*.
W. P. Burkinshaw, Esq.: hybrid Cattleyas.
Mrs. Norman Cookson: Cypripediums.
Messrs. James Veitch: *Neobenthamia gracilis*.
Messrs. Stanley: *Cattleya* × *iridescens*.
Messrs. William Bull: Cattleyas.

ORCHID COMMITTEE, SEPTEMBER 27, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids and rare species.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Stuart Low, Bush Hill Park, for a group.

Silver Banksian Medal.

To Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier), for varieties of *Dendrobium Phalaenopsis*.

To Messrs. Mansell & Hatcher, Rawdon, for Laeliocattleyas, &c.

To R. G. Thwaites, Esq., Streatham (gr. Mr. Black), for Odontiodas and Cattleyas.

To Messrs. William Bull, for hybrid Cattleyas.

First-class Certificate.

To *Cypripedium* × 'Shogun' (parentage unknown) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Dorsal sepal over 3 inches across, yellowish-green

at the base, white above, and with dark purple spotting. Petals and lip bronzy-yellow tinged with purple. (Fig. 197.)

Award of Merit.

To *Cattleya* × 'Dirce' *magnifica* (*Warscewiczii* × 'Vulcan' (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. A beautiful and large flower of a rosy-mauve with thin orange lines from the base of the lip.

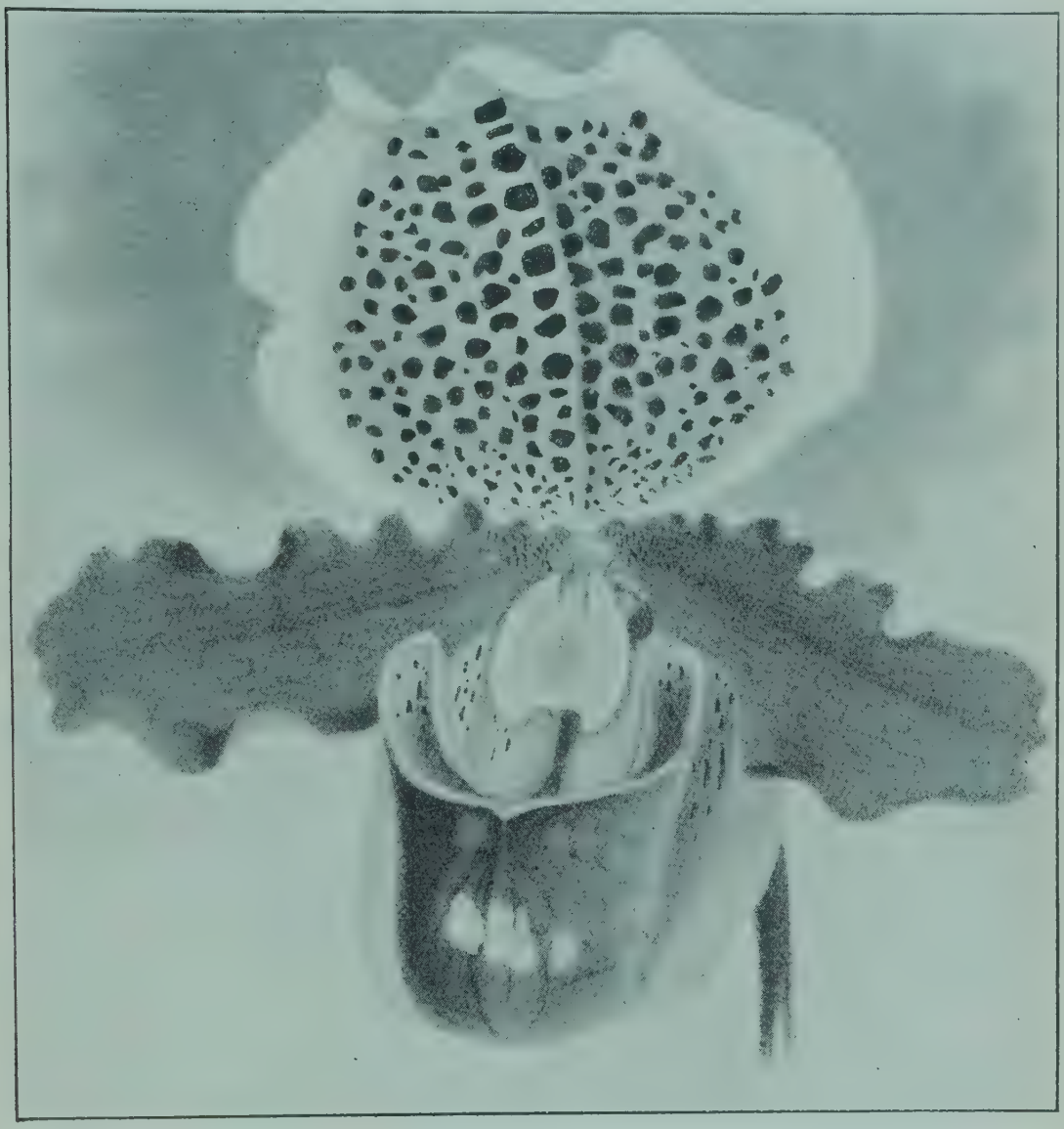


Fig. 197.—Cypripedium × 'Shogun.' (*Journal of Horticulture.*) (P. cclxxxiv.)

To *Laelia* × *Degeestiana* var. *Thompsonii* (*Jongheana alba* × *flava*) (votes, 12 for, 2 against), from William Thompson, Esq., Walton Grange (gr. Mr. W. Stevens). Form of *L. Jongheana*. Sepals and petals white, lip orange.

To *Cattleya* × *Luegeae* (× '*Enid*' × *Dowiana* 'Rosita') (votes, unanimous), from Messrs. Charlesworth. Sepals and petals bright magenta-rose. Lip broad, ruby-purple with gold veining from the base.

To *Phaius Cooperi* (votes, unanimous), from Messrs. Sander, St. Albans. In habit and size of flower resembling *P. grandifolius*. Sepals and petals equal, arranged fan-like; mahogany red with narrow yellow margin. Lip white with some rose markings in the tube. B. C. Jan. 11, 1910.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: hybrid Cypripediums.
Messrs. Jas. Cypher: a group.
Messrs. Stanley: hybrids.
Messrs. McBean: Cypripediums.
Francis Wellesley, Esq.: *Cattleya* × 'The Canon' (*Mantinii* × *Dowiana aurea*).
Mr. E. V. Low: a group.

ORCHID COMMITTEE, OCTOBER 11, 1910.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To R. G. Thwaites, Esq. (gr. Mr. Black), for hybrids.
To Messrs. Charlesworth, for Laeliocattleyas, &c.
To Messrs. Stuart Low, for a group.
To Messrs. Sander, for a group.
To Messrs. J. Cypher, for Cypripediums, &c.

Silver Banksian Medal.

To Mr. E. V. Low, for rare Orchids.
To Messrs. Stanley, for Laeliocattleyas.

First-class Certificate.

To *Cypripedium* × 'King George V' (*giganteum* × *Charlesworthii*) (votes, unanimous), from Mr. E. V. Low, Haywards Heath. A very fine flower, large and of good shape; dorsal sepal white with a green base and rose-purple lines; petals and lip tinged reddish-purple. (Fig. 198.)

Award of Merit.

To *Laeliocattleya* × 'Golden Oriole' *superba* (*L.-c.* × *Charlesworthii* × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Sepals and petals greenish canary-yellow; lip crimson, nearly covered with an orange tint and veining, the crimson colour showing at the margin and between the veining.

To *Laeliocattleya* × 'Ortrude' *magnifica* (*L. anceps* × *C. Dowiana aurea*) (votes, 14 for, 3 against), from Lieut.-Col. Sir George L. Holford, K.C.V.O. Sepals and petals cream-white tinged and veined with rose-purple; lip crimped, claret with obscure gold veining.

To *Cattleya* × 'Basil' ('Enid' × *Mantinii*) (votes, unanimous), from Messrs. Charlesworth. A large and finely formed flower, with rosy lilac sepals and petals, and ruby-red front to the lip.

To *Catasetum fimbriatum aureum* (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). Flowers apple-green, with some slight rose markings, the disc of the lip being bright yellow.

FIG. 198.—CYPRIPEDIUM × 'KING GEORGE V.' (*Gardeners' Magazine.*)
(P. cclxxxvi.)

Other Exhibits.

Sir George L. Holford: *Laeliocattleya* × 'Arethusa' (*C. Harrisoniana* × *L.-c.* × *exoniensis*), with a spike of ten flowers.

Monsieur Firmin Lambeau, Brussels: *Cypripedium* × *Fairtisii* (*Fairrieanum* × *Curtisii*).

Lady Audley Neeld, Grittleton (gr. Mr. Pitts): the same hybrid.

Mr. Sidney Florey, Twickenham: *Lycaste gigantea*, Tracy's variety.

Sir William Marriott (gr. Mr. Denny): a small hybrid Cattleya under the name *C. peckaviensis*.

Miss Violet Fellowes, Shotesham Park: a fine *Cypripedium Charlesworthii*.

Mr. Harry Dixon, Wandsworth Common: *Odontoglossum Dixonae* (*Edwardii* × *luteopurpureum* 'Hystrix').

Mrs. Norman Cookson (gr. Mr. Chapman): *Odontoglossum* × 'Clive' and *Cypripedium* × 'Sibyl' *punctatum*.

Messrs. Jas. Veitch: *Cypripedium* × 'Pyrrha,' of unknown origin.

Mr. Edward Roberts, Eltham (gr. Mr. Carr): *Cypripedium* × 'Venus,' Park Lodge variety.

Captain J. F. Laycock: *Cattleya* × 'Adula.'

Mr. Miller, Wisbech: *Cattleya* × 'Lord Nelson.'

ORCHID COMMITTEE, OCTOBER 25, 1910.

Mr. HARRY J. VEITCH in the chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Sander, St. Albans, for Cypripediums, Odontoglossums, &c.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Messrs. Stuart Low, Bush Hill Park, for a group.

Silver Banksian Medal.

To Messrs. Mansell & Hatcher, Rawdon, for Cattleyas, &c.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Mr. E. V. Low, Haywards Heath, for white Cattleyas, &c.

To Messrs. McBean, Cooksbridge, for a group, including *Cattleya Dowiana alba*.

First-class Certificate.

To *Odontioda* × *Bradshawiae*, Westonbirt variety (*O. crispum* 'Britannia' × *C. Noezliana*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flowers equal in size and shape to those of the *O. crispum*; sepals orange red with cream-white margin tinged with lilac; petals broadly ovate, cream-white tinged with rose and with a large and uniform orange red blotch; lip whitish tinged with rose and with a chestnut red blotch. (Fig. 199.)

To *Cypripedium* × 'Princess Mary' (*niveum* × 'Helen II.') (votes, 15 for, 1 against), from Messrs. Sander. A fine pure white hybrid with violet spotting on the dorsal sepal and petals. (Fig. 200.)

FIG. 199.—ODONTIODA BRADSHAWIAE, WESTONBIRT VAR. (*Orchid World.*)
(P. cclxxxviii.)

Award of Merit.

To *Cypripedium* × 'Britannia' (parentage unknown) (votes, unanimous), from Messrs. Sander. A large flower of the *C.* × 'Aeson' *giganteum* class. Lower half of the dorsal sepal emerald green with chocolate purple spotting, upper half white; lip and petals honey yellow tinged and veined purple.

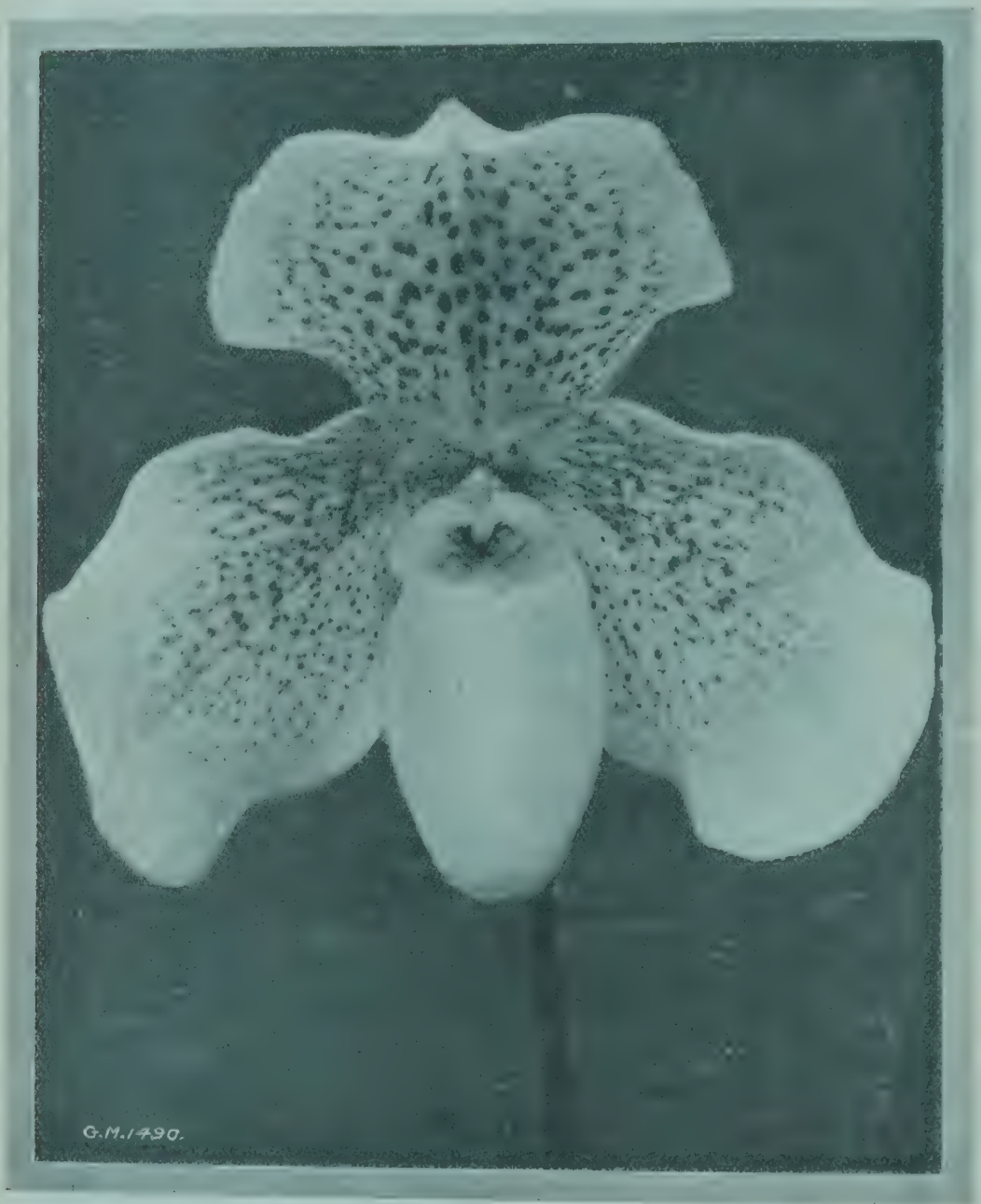


FIG. 200.—CYPRIPEDIUM × 'PRINCESS MARY.' (*Gardeners' Magazine.*) (P. cclxxxviii.)

To *Calanthe densiflora* (votes, unanimous), from Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier). An old but rare species from Sylhet and Assam. Scape erect and bearing a dense head of pale yellow flowers furnished with prominent bracts.

To *Cypripedium* × 'Reginald Young' (*Hitchinsiae* × *insigne*, 'Harefield Hall') (votes, unanimous), from H. J. Bromilow, Esq., Rann Lea, Rainhill (gr. Mr. Morgan). A flower of fine substance. Dorsal sepal Indian yellow on the basal half, white above and with large chocolate purple blotches; petals and lip yellow tinged with reddish purple.

To *Odontoglossum* × 'Circe' (*Cervantesii* × *Pescatorei*) (votes, unanimous), from Messrs. Charlesworth. Flowers nearest to *O. Cervantesii*, white spotted with red on the inner halves of the segments.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. Alexander). showed *Laeliocattleya* × 'Barbarossa,' Westonbirt variety (*L.-c.* × *callistoglossa* × *C. Trianaei* 'Imperator').

Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier): species.

Messrs. Jas. Veitch: well-known Orchids.

J. Gurney Fowler, Esq. (gr. Mr. Davis): *Cypripedium* × 'Priscilla' (*exul* × *insigne* 'Harefield Hall').

R. G. Thwaites, Esq. (gr. Mr. Black): a fine white *Laelia pumila* and *Odontioda* × *Seymourii*.

Francis Wellesley, Esq. (gr. Mr. Hopkins): *Sophrolaeliocattleya* × *Veitchii* var. 'Eros.'

H. S. Goodson, Esq. (gr. Mr. Day): rare orchids.

ORCHID COMMITTEE, NOVEMBER 8, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids, &c.

To Messrs. Sander, St. Albans, for Cattleyas, Laeliocattleyas, &c.

To Messrs. Stuart Low, Enfield, for a group.

To Messrs. W. Baylor Hartland, Cork, for hybrids of *Cattleya Bowringiana*, &c.

To Messrs. Cypher, Cheltenham, for Cypripediums.

Silver Banksian Medal.

To E. R. Ashton, Esq., Tunbridge Wells, for Laeliocattleyas &c.

To R. G. Thwaites, Esq., Streatham (gr. Mr. Black), for Cochliodas and other hybrids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for a group.

First-class Certificate.

To *Sophrocattleya* × 'Doris,' Cobb's variety (*C. Dowiana* × *S. grandiflora*), from Walter Cobb, Esq., Normanhurst, Sussex (gr. Mr. C. J. Salter). A large and finely formed bright scarlet flower. (Fig. 201.)

Award of Merit.

To *Laeliocattleya* × Olivia' (*L. Jongiana* × *C. Schroderae*; (votes, unanimous), from Lieut.-Colonel Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flower large and with very broad petals; blush-white tinged and veined pink, the greater part of the lip being dark orange.

FIG. 201.—SOPHROCATTLEYA × 'DORIS,' COBB'S VARIETY. (P. ccxci.)

To *Calanthe* × *Cooksoniae gigantea* (*vestita rubro-ocellata gigantea* × *Harrisii*) (votes, unanimous), from Mr. Norman Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman). Formed like *C. Sedeni Harrisii* but larger and pure white.

Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H.: rare species.
Lieut.-Colonel Sir George L. Holford, K.C.V.O.: hybrids.
Francis Wellesley, Esq. (gr. Mr. Hopkins): *Laeliocattleya* × 'Epicasta' variety.

Fig. 202.—Cypripedium × 'Minotaur.' (*Gardeners' Magazine.*) (P. ccxcv.)

Samuel Larkin, Esq. (gr. Mr. Hale): hybrids.
Messrs. McBean: Cypripediums.
Messrs. Stanley: a group.
Monsieur Mertens: Odontoglossums.

ORCHID COMMITTEE, NOVEMBER 22, 1910.

Mr. HARRY J. VEITCH in the Chair, and eighteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day), for a group and a collection of drawings of Orchids in his garden.

FIG. 203.—CYPRIPEDIUM CHARLESWORTHII 'TÉMÉRAIRE.' (*Gardeners' Chronicle.*) (P. ccxcvi.)

Silver Flora Medal.

To J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis), for a large group of Cypripediums.

To Messrs. Jas. Veitch, Chelsea, for hybrid Cypripediums.
To Messrs. Jas. Cypher, Cheltenham, for Cypripediums.

Silver Banksian Medal.

To Pantia Ralli, Esq., Ashtead (gr. Mr. Hunt), for Calanthes.
To Samuel Larkin, Esq., Haslemere (gr. Mr. Hale), for a group.
To Messrs. McBean, Cooksbridge, for a group of *Cypripedium insigne Sanderae*.
To Messrs. Stuart Low, for a group.

FIG. 204.—VANDA COERULEA SANDERAE. (P. CCXCVI.)

First-class Certificate.

To *Cypripedium* × 'Minotaur' ('Hera Euryades' × 'Minnie') (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). A noble flower. Dorsal sepal large and pure white with claret-purple blotches; petals

and lip yellow, tinged with chocolate-purple. The parentage gives: *C. insigne* 3, *C. Spiceranum* 2, *Boxallii* 1, and *villosum* 1. (Fig. 202.)

To *Cypripedium Charlesworthii* 'Téméraire' (votes, 13 for, 2 against), from Messrs. Sander, St. Albans. A very remarkable form with the dorsal sepal over 3 inches in height and nearly 4 inches across; white tinged and veined with rosy-lilac. (Fig. 203.)

FIG. 205.—CYPRIPEDIUM × 'IOLANTHE.' (*Garden.*)

To *Vanda coerulea Sanderae* (votes, unanimous), from Messrs. Sander. Flowers of good form, white tinged with magenta-pink and without any trace of the blue of the typical form. (Fig. 204.)

Award of Merit.

To *Cypripedium* × 'Iolanthe' ('Hera Euryades' × *insigne Sanderae*) (votes, unanimous), from Messrs. Jas. Veitch. Dorsal sepal

white with purple spotting; petals and lip yellow tinged with chocolate-purple. (Fig. 205.)

To *Cattleya* × *lucida* (*Bowringiana* × *Schilleriana*) (votes, unanimous), from Samuel Larkin, Esq., Haslemere (gr. Mr. Hale). A fine winter-flowering hybrid with rose-purple flowers. The plant bore three spikes of ten to twelve flowers each.

To *Sophrolaeliocattleya* × 'Alethaea' (*C. Percivaliana* × *S.-c.* × *Gratrixiae*) (votes, unanimous), from H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. G. E. Day). Sepals and petals pale rose with a light golden hue; lip ruby-crimson with yellow veining.

Cultural Commendation.

To Mr. Spowage, gr. to Col. Cary Batten, Abbots Leigh, Clifton, for *Oncidium tigrinum*, with 53 flowers on a spike.

Other Exhibits.

R. G. Thwaites, Esq., Twickenham: hybrids.
Monsieur Firmin Lambeau: two Cattleyas.
Messrs. Sander: rare Orchids.
Messrs. Charlesworth: a group.
Henry Little, Esq.: *Cypripedium insigne* var.
Mr. E. V. Low: a group.

ORCHID COMMITTEE, DECEMBER 6, 1910.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, for hybrids and rare species.

Silver Flora Medal.

To Messrs. Sander, for a varied group.

Silver Banksian Medal.

To Samuel Larkin, Esq., The Ridgeway, Haslemere (gr. Mr. Hale), for Odontoglossums and Laeliocattleyas.

To Messrs. Stuart Low, for Oncidiums, Dendrobiums, &c.

To Messrs. Mansell & Hatcher, for a group.

To Messrs. J. Cypher, for Cypripediums.

To Messrs. Armstrong & Brown, for a group.

To the Rt. Hon. Lord Hillingdon, for a group of *Zygopetalum Mackayi*.

Award of Merit.

To *Vanda coerulea* 'Bluebeard' (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Flowers large, indigo-blue with the white ground colour showing between the veining.

To *Odontoglossum* × 'Rouge Dragon' (× 'Phœbe' × *ardentissimum*), (votes, unanimous), from W. R. Lee, Esq., Plumpton Hall, Lancashire. Resembling a finely blotched *O. ardentissimum*, but showing traces of *O. cirrhosum*, derived through *O.* × 'Phœbe,' in the apiculate segments.

To *Odontoglossum* × 'Ceres,' Plumpton Hall variety (*Rossii* × *Rolfeæ*) (votes, 14 for, 2 against), from W. R. Lee, Esq. Flowers differing from the original in the larger labellum and rosy tint.

To *Cypripedium* × 'Waterloo' ('Mrs. Wm. Mostyn' × 'Ranjitsinhji') (votes, unanimous), from Mr. E. V. Low, Vale Bridge, Haywards Heath. A fine dark flower, with chocolate-purple dorsal sepal, white on the upper half.

Botanical Certificate.

To *Angraecum pellucidum*, from J. S. Bergheim, Esq., Belsize Court, Hampstead (gr. Mr. H. A. Page). Flowers in long pendulous racemes, whitish, semi-transparent; labellum fringed. West Africa. (Fig. 206.)

To *Dendrobium speciosum nitidum*, from Sir Jeremiah Colman, Bart. (gr. Mr. Collier). More slender in growth than the type. Flowers rather smaller, cream-white. Australia.

To *Brassia Forgetiana*, from Messrs. Sander. Of the *B. maculata* section. Flowers greenish-white with dark red bars on the inner parts of the segments, crest orange colour. Peru. (Fig. 208.)

Cultural Commendation.

To Mr. W. H. White, orchid grower to Sir Trevor Lawrence, Bart., K.C.V.O., for *Lycaste costata* with twenty-one flowers.

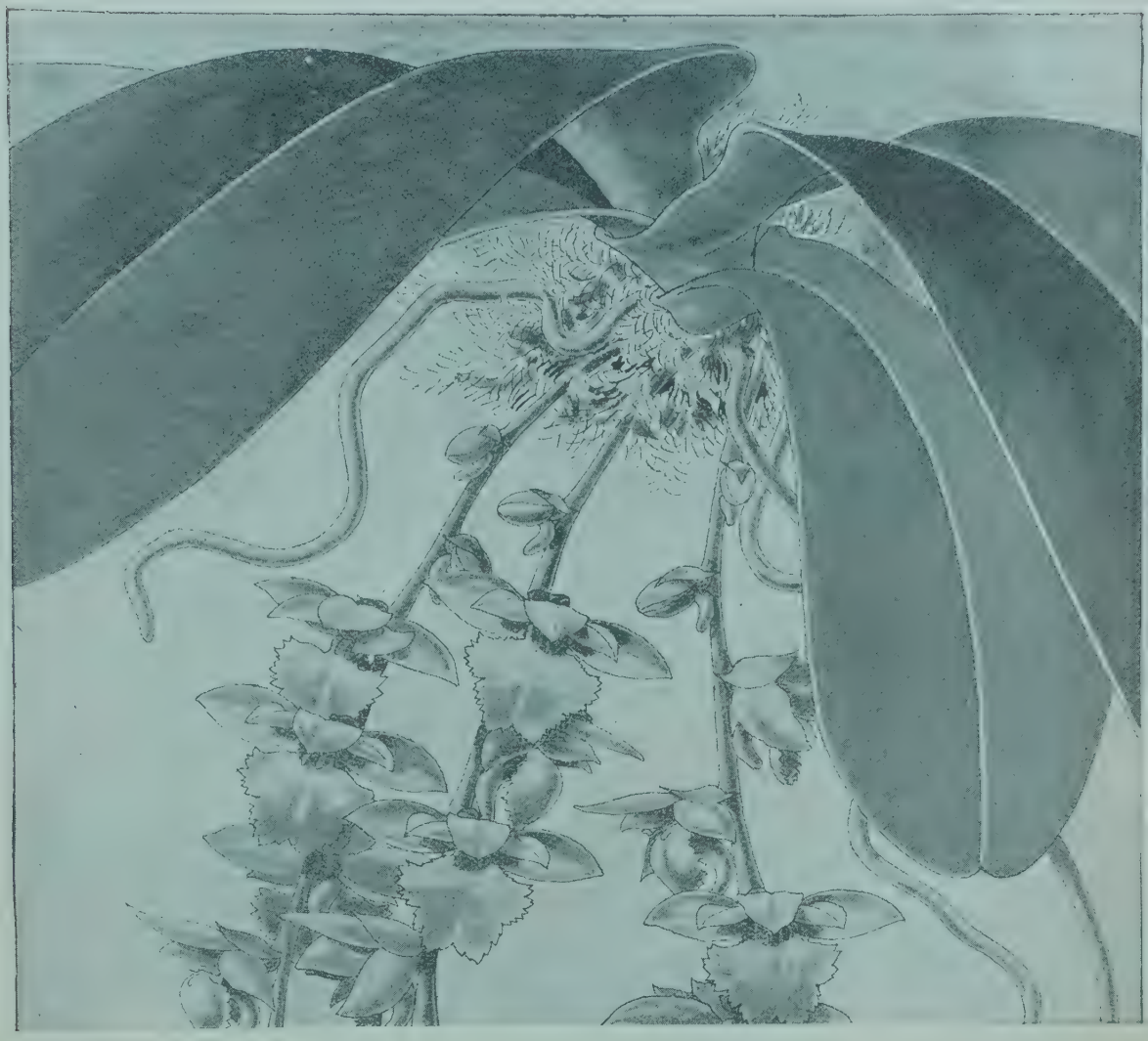
To Mr. Bristow, gardener to Mrs. Temple, Groombridge, for *Laelia anceps Amesiana*, Temple's variety.

To Mr. Collier, gardener to Sir Jeremiah Colman, Bart., for *Dendrobium speciosum nitidum*, with forty-six flower-spikes.

To Mr. Balmforth, gardener to F. M. Ogilvie, Esq., Oxford, for *Odontioda* × *Charlesworthii*, with a spike of seventeen flowers.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: hybrids.
His Grace the Duke of Marlborough: Cypripediums
Lady Audley Neeld: *Cypripedium* × 'Draco.'
Francis Wellesley, Esq.: hybrids.
W. H. St. Quintin, Esq.: Laeliocattleyas.
Messrs. Stanley: hybrids.
Mr. E. V. Low: a small group.
R. G. Thwaites, Esq.: hybrids.
Henry Little, Esq.: *Cypripedium insigne*, Little's var.
R. Brooman-White, Esq.: Odontoglossums.
Monsieur Mertens: hybrid Odontoglossums.
Messrs. Jas. Veitch: hybrid Cypripediums.



Richard Le Doux, Esq.: Cypripediums.
Messrs. Jones & Howes: white *Vanda coerulea.*
Messrs. W. B. Hartland: Cypripediums.

ORCHID COMMITTEE, DECEMBER 20, 1910.

Mr. J. GURNEY FOWLER in the Chair, and fourteen members present.

Awards Recommended:—

First-class Certificate.

To *Odontoglossum* × 'Ceres' *magnificum* (*Rossii rubescens* × *Rolfeae*) (votes, unanimous), from Messrs. Charlesworth, Haywards

FIG. 207.—ODONTOGLOSSUM × 'CERES' MAGNIFICUM.

Heath. In colour resembling *O. Rossii rubescens.* Sepals and inner parts of the petals barred with claret-red, tips of petals and lip tinged with rose. (Fig. 207.)

Award of Merit.

To *Laeliocattleya* × 'Pauline' (*L.-c.* × 'Ophir' × *C. labiata alba*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Equal in size to *C. labiata*; white tinged with canary-yellow, the lip veined with purple.

To *Cypripedium* × 'Dante' *rotundiflorum* ('Hera Euryades' × *Charlesworthii*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. A finely formed flower. Dorsal sepal white with a small rose-purple base. Petals and lip gamboge-yellow tinged with purple.

To *Cypripedium* × 'Gaston Bultel' (parentage uncertain) (votes, unanimous), from Mr. E. V. Low, Haywards Heath. Dorsal sepal large and flat, dark rose, with claret lines ascending to the white margin. Petals and lip purplish.

To *Miltonia Warscewiczii leucochila* (votes, unanimous), from Messrs. Charlesworth. Differing from the type in having a broad white band to the lip.

Cultural Commendation.

To Mr. J. Collier, gardener to Sir Jeremiah Colman, Bart., for a plant of *Odontioda* × *Bradshawiae*.

Other Exhibits.

Lieut.-Col. Sir G. L. Holford: hybrid Cypripediums.
Pantia Ralli, Esq.: *Cattleya Dusseldorfei* 'Undine.'
Samuel Larkin, Esq.: three hybrids.
R. G. Thwaites, Esq.: two hybrids.
Messrs. Charlesworth: various Orchids.
Messrs. McBean: *Sophrocattleya* × 'Doris.'
Messrs. Armstrong & Brown: hybrids of *Cypripedium Fairrieanum*.
Messrs. Jas. Veitch: hybrid Cypripediums.
A. Harrison, Esq.: Laeliocattleyas.
F. J. Hanbury, Esq.: Laeliocattleya (*L. autumnalis* × *C. labiata*).

ESTABLISHED
1804.

INCORPORATED
1809.

TELEGRAMS:
"HORTENSIA, LONDON."

TELEPHONE:
5363 WESTMINSTER

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. General.
2. Letters.
3. Telephone and Telegrams.
4. Journals Wanted.
5. Subscriptions.
6. Form of Bequest.
7. Privileges of Chemical Analysis.
8. List of Fellows.
9. New Fellows.
10. An Appeal.
11. Lindley Library.
12. The Society's Gardens at Wisley.
13. Rock Garden at Wisley.
14. New Bothy at Wisley.
15. Trials at Wisley in 1911–12.
16. The Wisley Research Station.
17. Students at Wisley.
18. Distribution of Surplus Plants.
19. Exhibitions, Meetings, and Lectures in 1911.
20. Dates fixed for 1911.
21. Summer Show, Olympia, 1911.
22. Cups at Olympia.
23. British Fruit and Vegetables.
24. Challenge Cups for Vegetables.
25. Shows of kindred Societies in 1911.
26. Examinations, 1911.
27. Information.
28. Inspection of Fellows' Gardens.
29. Affiliation of Local Societies.
30. Union of Horticultural Mutual Improvement Societies.
31. Alterations in Rules for Judging—1909 Code.
32. Spraying of Fruit Trees.
33. Varieties of Fruits.
34. Plants Certificated.
35. International Horticultural Exhibition, May 22–30, 1912.
36. Recognition of Diligent Interest in Plants.
37. Lizards Wanted.
38. MS. for Journal.
39. Advertisements.

Please notice a flyleaf inserted having reference to a proposal made at the last Annual Meeting that a purely scientific issue of the Transactions should be published.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 WESTMINSTER.**
"HORTENSIA, LONDON," is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted:—

VOLUME V. Part 1.	VOLUME XIII. Part 1.
VOLUME X.	VOLUME XIV.

These are therefore particularly asked for.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1st of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1st. It may be a week or more before the Tickets reach the Fellows, owing to the very large number, over 20,000, to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ , to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge

for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 80 in the "Book of Arrangements," 1911.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL and the "Book of Arrangements." (Advt. pp. 33, 36.)

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows is due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, especially in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the number of Fellows.
2. Helping to swell the General Prize Fund started by Mr. A. W. Sutton, V.M.H., for providing Prizes for the Students at Wisley.
3. Providing lectures with lantern slides.
4. Presenting books to fill the gaps in the Library both at Vincent Square and at Wisley.
5. Sending new and rare Plants and Seeds for the Garden and surplus roots for distribution to the Fellows.
6. Sending plants for the *New Rock Garden* at Wisley.

Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary, therefore, asks those who read these lines to do their best to help in any of the ways above indicated.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

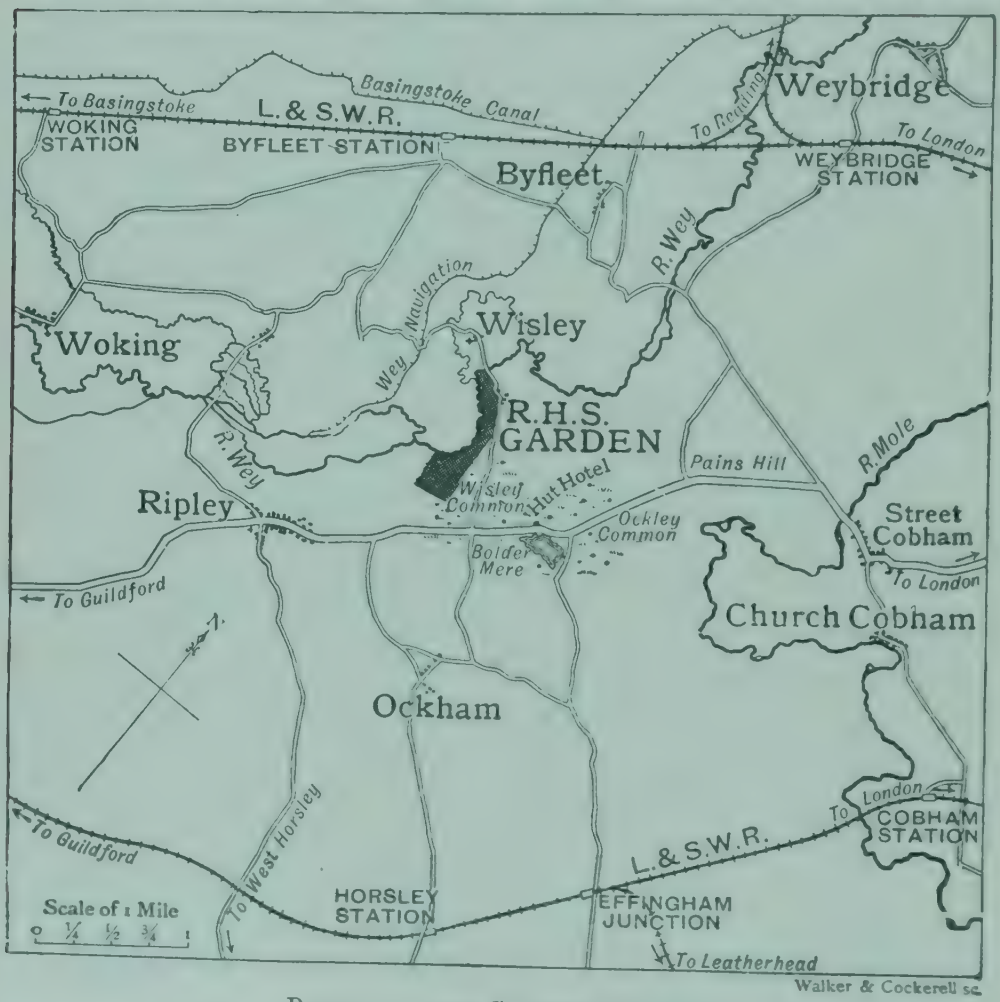
11. LINDLEY LIBRARY.

The Society acting in and through its Council, having now become sole trustee of the Lindley Library, Fellows and friends of the R.H.S. have the encouragement of knowing that their gifts to the Library can never be lost to the Society, but are attached to it in perpetuity. It should now be the aim of all to make the Library far more perfect and complete than it is at present. Gifts of books, old or new, will be gratefully accepted.

12. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition days. Each Fellow's ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White,



POSITION OF THE SOCIETY'S GARDENS.

fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*;

or to and from Horsley, 7*s.*; Effingham Junction, 7*s.*; Byfleet, 7*s.* Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s.* by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 118.

13. ROCK GARDEN AT WISLEY.

In consequence of the rapidly increasing interest taken in what are technically called "Alpine Plants," "Alpines," or "Rock Plants," the Council have decided to construct a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that or where best to plant this or that. The construction of the Rock Garden has begun and is making good progress, but it will be two, or possibly three, years or more before the plants on it can be seen at their best.

14. NEW BOTHY AT WISLEY.

The Council has always been anxious to promote the welfare of their gardeners, and with this object in view they have recently completed a new bothy, which they hope may prove of use far and wide as establishing the desirable *via media* between extravagance on the one hand and disregard of the men's comfort on the other. It may well serve as a model for the construction of bothies elsewhere.

15. TRIALS AT WISLEY IN 1911-12.

Trials of Fruits, Flowers, and Vegetables at the Wisley Gardens during 1911–12 have been arranged as follows :—

[N.B.—Everything sent for trial *must be named*, and the name and address of the Sender attached.]

Fruit.—Strawberries and raspberries, autumn fruiting. These trials will be continued.

Flowers.—Fuchsias for bedding and for the conservatory. Two plants of each to be sent in early March.

Begonias (fibrous), including summer and winter flowering and bedding varieties. Two plants of each to be sent in March.

Delphiniums. Two plants of each in February.

Dahlias (decorative), introduced into commerce since January 1, 1908. Two plants of each in May.

Primulas (hardy) for borders and rock work. Three plants of each in February.

Vegetables.—Carrots. ½ oz. of each early in February.

Cucumbers. 6 seeds of each in February.

Peas. 1 pint of each early in February.*

Cabbages, Savoy. 1 packet of seed of each in March.

Potatos, 'mid-season' and 'late.' Each variety must be labelled as being 'mid-season' or 'late.' 20 tubers of each to be sent by February.

If sent by post: The Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

If sent by rail: The Superintendent, R.H.S. Gardens, Wisley, Horsley Station, L. & S.-W. R., with advice by post to the Superintendent.

16. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture, and Lecturer to the Students.

17. STUDENTS AT WISLEY.

N.B. There will be a few vacancies for the two years' Course commencing on September 25, 1911. Early application should be made to the Secretary of the Society.

The Society admits young men, between the ages of 16 and 22 years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also lectures, demonstrations, and elementary Horticultural Science in the Laboratory, whereby a practical knowledge of simple Garden Chemistry, Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students can enter only at the end of September or at the end of March. Selected Students have the advantage of attending certain of the Society's Shows and Lectures in London.

18. DISTRIBUTION OF SURPLUS PLANTS.

In a recent Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste heap. A few Fellows, noticing this,

* *Trial of Peas.*—It has been pointed out that it is not fair to compare and to adjudicate on the merits of varieties of Peas sown on different dates; but that all peas sent for trial ought to be sown on one and the same day. The Council felt, however, that it would not be quite fair on an admittedly late pea to sow it on the same day as an admittedly early one. It has therefore been decided to ask for one pint of seed peas and divide it into three parts, and make sowings of all varieties on three different dates suiting Early, Mid-season, and Late peas, as in this way only can the two difficulties be overcome.

asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was therefore decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by ballot.

Fellows are therefore particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are of necessity *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is therefore obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their form properly.

19. EXHIBITIONS, MEETINGS, AND LECTURES IN 1911.

The programme will be found in the "Book of Arrangements" for 1911. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (29) of halfpenny cards *ready addressed* to himself.

20. DATES FIXED FOR 1911.

Jan. 3, 17, 31
Feb. 14, 28
March 14 and 15 (Bulbs), 28
April 11, 25 (Auriculas)
May 9, 23 to 25 (Temple Show)
May 30 to June 2 (Rhododendron Show) *
June 6, 20
July 4, 5, & 6 (Olympia), 11 & 12 (Sweet Peas), 18, 25 (Carnations)
August 1, 29, 30 (Vegetables)
Sept. 12, 14 (Autumn Roses), 26 (Vegetable Show)
Oct. 10, 11 (Fruit Show), 24
Nov. 7, 21
Dec. 5

21. SUMMER SHOW, OLYMPIA, 1911.

(See also p. 55, "Book of Arrangements.")

The President and Council announce that the Society's Summer Show at Olympia will be open as follows:—

On July 4th it will open at noon, and close at 10 p.m.
„ 5th „ „ 9 a.m. „ „ 10 p.m.
„ 6th „ „ 9 a.m. „ „ 6 p.m.

The Prices of Admission will be:—

On July 4th, 12 to 6—7*s.* 6*d.*; 6 to 10—1*s.*		Fellows' tickets free.
„ 5th, 9 „ 6—2*s.* 6*d.*; 6 „ 10—1*s.*		
„ 6th, 9 „ 6—1*s.*	Closed at 6 p.m.	

For some years past the Society's great Summer Show, lasting two days, has been held under canvas in the grounds of Holland Park, Kensington. The show has grown increasingly popular, crowds attending even when heavy rain must have prevented the presence of many; but this site being unobtainable in 1911, the large Olympia Hall has been engaged for a three days' Exhibition. Such a site for a Flower Show offers many advantages over tents, not the least being the dryness underfoot, protection from uncertain weather, and the ability to keep the Show open in the evening.

A Show of such excellent character as Olympia must attract, is stimulating the Council to make every effort, not only to present a floral display such as will not have been seen in London during the last half century, but also to bring together visitors from all parts of the country.

* The Fellows' Tickets were unfortunately printed before the arrangements for this Show could be completed. Will Fellows please insert it on their tickets, and mak a memorandum of it.

that the Exhibition may render as complete a service as possible to amateurs, horticulturists, gardeners, and the great and wide-spread garden-loving public. Of those interested in gardening, a very large proportion have never seen the Shows of the Society because, first, they have been open only during business hours; and, secondly, the expense a visit entails is, for distant country dwellers, too considerable.

The Olympia Show will correct the first difficulty, as on two evenings it will remain open until 10 p.m. On the third day it must close at six o'clock to permit exhibits to be cleared within the time circumscribed by other engagements at the Hall.

The Railway Companies have, moreover, been asked to run excursion trains to London for July 4th, 5th, and 6th, and the majority have assented. The Railway Companies will issue their usual notices of excursions ten days before the Show. Enquiries should be addressed to the Companies direct and *not* to Vincent Square. Attention is called to the footnotes on pp. 56 and 67 of the "Book of Arrangements."

The Show will be widely advertised amongst the Fellows of the Society, the greater outside public, and every daughter Society in the Country. Posters have been prepared for display throughout the Country, and Picture Post Cards, giving particulars of the Show, may be had free on application to the Secretary of the Society, Vincent Square, S.W., for Fellows to send to their friends who are not yet Fellows. The Horticultural Trade may purchase these Picture Post Cards at cost price. Fellows and Members of Societies represent only the nucleus of lovers of flowers, and it is hoped that by thus making the Show well known, and by the facilities for reaching London being made financially easier, a wide and lasting benefit may be secured.

Abundant accommodation for sundries has been provided surrounding the walls of the Main Hall. The spaces and rents apportioned are indicated on a plan to be obtained from the office. A rebate of 10 per cent. on these rents will be allowed to exhibitors who are also Fellows of the Society. Spaces should be booked at once.

Intimations from Affiliated Societies have already been received that it is their intention to make a visit to the Olympia Show the "Summer Outing" of their Societies.

AFFILIATED SOCIETIES

are asked to observe the special admission fee of 1s. during the second *day* at Olympia for those of their Members who are *bonâ fide* Gardeners (see p. 58, "Book of Arrangements").

To assist those who are unfamiliar with the Railway connexions with Olympia, it has been arranged with Messrs. Tilling, Ltd., Peckham, London, S.E., that Omnibuses be sent to meet parties of twelve or more, and they will be conveyed at specially low rates to Olympia, the amount of which rate will depend on the number of applications made. Those intending to avail themselves of this convenience should *communicate direct* with Messrs. Tilling (*please do not write to the Secretary of the*

R.H.S.) intimating their Railway terminus in London, time of arrival, number of their party, etc. Visitors will be wholly responsible for their own arrangements with Messrs. Tilling.

The nearest stations to Olympia are Addison Road and High Street, Kensington.

A Schedule of the Show may be obtained from the Secretary.

22. CUPS AT OLYMPIA.

The Council offer for Open Competition at the Olympia Show a handsome Sixty-guinea Silver-gilt Challenge Cup, to be called "The Coronation Challenge Cup." It will be awarded to what in the opinion of the Council is the most meritorious exhibit in the Show.

The Council have accepted Mr. N. N. Sherwood's offer of a Twenty Guinea Silver Cup. It will be awarded by them for Fruit shown in open Competition.

A further Twenty Guinea Silver-gilt Cup has been offered to the Council by the New Olympia Company, Ltd, and accepted by them for award at this Show to Roses. Competition open.

23. BRITISH FRUIT AND VEGETABLES.

In 1911, the Great Fruit Show will be held on October 10 and 11 and the Vegetable Show will be combined with the Ordinary Meeting on September 26. The Schedules of the Prizes are now ready.

24. CHALLENGE CUPS FOR VEGETABLES.

A handsome Silver-gilt Challenge Cup has been presented to the Society by Messrs. Sutton, of Reading, and the Council will again offer it, with £10, for vegetables on September 26, 1911. The Society also offers a Champion Challenge Cup for the greatest number of points obtained by any one exhibitor throughout the same Exhibition, the winner of the Sutton Cup being excluded. These Cups may be won by the same exhibitor only once in three years, but he may compete every year for any second prize that may be offered.

25. SHOWS OF KINDRED SOCIETIES IN 1911.

The following dates have been fixed, on which R.H.S. Fellows' tickets will admit:—

April 25.—Auricula Society.	July 25.—Carnation Society.
May 24.—Tulip Society.	August 30.—Vegetable Society.
July 11-12.—Sweet Pea Society.	September 14.—Rose Society.

For Schedules of these Shows see under above dates in the "Book of Arrangements," 1911.

A large Show of Rhododendrons and other plants will also be held from May 30 to June 2 in the Royal Horticultural Hall, Vincent Square, S.W. Fellows' tickets admit free.

26. EXAMINATIONS, 1911 & 1912.

1. The Annual Examination in the Principles and Practice of Horticulture will be held in April 1912. The Examination has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Particulars for 1912 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1910 (price 2*s*. post free) may also be obtained from the Office. The Society is willing to hold an examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Examination will not be held outside the British Isles until further notice.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1912 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening in April 1912. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this Examination is on similar lines to that of the more general Examination. Questions on Elementary Chemistry and Biology are included in this Examination.

3. The Society will hold an Examination in the Royal Horticultural Hall, Vincent Square, S.W., on Monday, January 8, 1912, for gardeners employed in Public Parks and Gardens belonging to County Councils, City Corporations, and similar bodies. Entries close on January 1, 1912.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations. The Syllabus may be obtained on application to the Secretary R.H.S., Vincent Square.

27. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions by applying to the Secretary R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is

particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

28. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

29. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 300 Societies have joined our ranks, and the number is steadily increasing.

The Parent Society offers annually a Silver Challenge Cup to be competed for by Affiliated Societies. (For alteration of conditions, see "Book of Schedules," under date October 10 and 11.)

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s*. 6*d*. for 10 copies, 5*s*. 6*d*. for 20, 11*s*. 6*d*. for 50, 20*s*. for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s*. 6*d*., with case complete; Silver, 12*s*. 6*d*., with case complete; Silver-gilt, 16*s*. 6*d*., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d*. each.

30. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A new and revised list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary R.H.S., price 3*d*.

Lantern slides on horticultural topics are much needed, and their gift will be very much appreciated.

31. ALTERATIONS IN RULES FOR JUDGING—1909 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," are being revised, and the new edition will be ready in May. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. (See also p. 36, "Book of Arrangements.") The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The secretaries of local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s*. 6*d*., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the 1909 Code of Rules have been still further modified.

32. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s*. The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

33. VARIETIES OF FRUITS.

Many people plant Fruit trees without a thought of what Variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d*. they can obtain from the Society a little 16-page pamphlet which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of Fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d.*, or 25, 2*s.*; 50, 3*s.*; 100, 4*s.*

34. PLANTS CERTIFICATED.

The last published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further 11 years have now passed and the Council have decided to republish the list up to date, constituting a record of all the plants which have received awards during the past 50 years. The completed list will be of great assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It is now ready, price 2*s.* post free, not including Orchids.

Orchids Certificated.

The list of awards made to Orchids, with parentage, &c., has recently been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s.* net.

35. INTERNATIONAL HORTICULTURAL EXHIBITION, MAY 22-30, 1912.

Most of the Fellows of the Society will have already heard with pleasure that an Association has been formed to organize an International Flower Show in London in the spring of 1912, as the outcome of a suggestion made by the Secretary of the Society that such a courtesy on the part of Great Britain was due (or indeed overdue) to the Continent and to America for the many similar hospitalities which foreign countries have offered to British horticulturists.

The Executive Committee now consists of prominent people of various professions and callings (including several leading gardeners), in whom every confidence may be placed to bring the proposal to a satisfactory conclusion on points of organization, exhibits, and finance. A large number of noblemen and gentlemen have lent their names to the scheme, together with many men of position and renown in science.

It must be fully understood and constantly borne in mind that the Royal Horticultural Society is not organizing the Exhibition, and that for many excellent reasons. Fellows are, therefore, asked from the very beginning to recognize the Exhibition as being absolutely distinct from the Society, being, in fact, an entirely separate and independent organization. The Society has, however, most warmly welcomed the proposal that such an International Exhibition should be held, and it will render the Association every assistance in its power.

The Association, recognizing the importance of securing the great weight of horticultural interest vested in the Society, have approached the Council with a view to establishing a suitable friendly working arrangement between the two bodies. Negotiations have accordingly been actively proceeding, whereby it has been decided that—

(*a*) The Royal Horticultural Society agrees—

1. To forego in 1912 its great Spring Show hitherto held, by kind permission of the Master and Benchers, in the gardens of the Inner Temple;

2. To contribute £1,000 towards the expenses of promoting the International Exhibition; and

3. To guarantee a further sum of £4,000 against the hardly probable contingency of there being an ultimate loss on the Exhibition.

(*b*) The Executive Committee of the International Exhibition, 1912, agrees—

1. To give to all Fellows of the Society certain special and definite privileges (to be published in due time) over the general public in regard to the purchase of tickets for the Exhibition; and

2. To allow all such tickets purchased by Fellows of the Society to be transferable.

Fellows are particularly requested not to write to the Society on the subject of the Exhibition, or of tickets therefor, until the definite privileges accorded by the Exhibition Committee to the Fellows of the Society have been published, but to address any communication on the subject to Edward White, Esq., Hon. Sec., International Horticultural Exhibition, 7, Victoria Street, Westminster, S.W.

International Exhibition, 1912, and The Royal Horticultural Society.

Subscribers and Guarantors to the International Exhibition, 1912, who happen to be Fellows of the Royal Horticultural Society, are requested to understand clearly that the privileges they become entitled to in return for their contribution to the International, have nothing whatever to do with the R.H.S. With reference to such privileges they must correspond only with the International.

On the other hand, the privileges to which Fellows of the Society are entitled as a result of the arrangement made by the Council of the R.H.S. with the Executive of the International—the distribution of these privileges will be made entirely by the officers of the R.H.S., the officers of the International having nothing whatever to do with the carrying out of the arrangement.

Consequently,

1. For all matters relating to or connected with Subscription or Guarantee to the International Exhibition, address Ed. White, Esq., Hon. Sec., International Exhibition, 7, Victoria Street, Westminster; and,

2. For all matters relating to privileges pertaining to anyone as a Fellow of the Royal Horticultural Society, address Secretary, R.H.S., Vincent Square, S.W. (See previous page.)

It will further be seen from this, that,

3. If a Fellow of the R.H.S. subscribes, say, £10 10s. to the International, obtaining thereby the privilege of tickets for the International to the value of £12 12s., the number of tickets to be issued by the International in respect of that £12 12s. cannot be computed on the basis of the arrangement made with the R.H.S., but must be calculated simply on their face value, and will be sent direct from the International Offices, 7, Victoria Street, Westminster.

Ed. White,
Hon. Sec. International, 1912.

W. Wilks,
Secretary, R.H.S.

36. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of encouragement of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden plot keeping, or nature study, has secured the first prize. The cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W. (price 6*d*. each), and signed by the head master or mistress and a member of the education authority concerned. The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number of prizes awarded in the competition, (*e*) the full name of the first prize winner. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

37. LIZARDS WANTED.

The Secretary of the Society has a great desire to reintroduce the common "scaly lizard" of English heaths and gorse commons in a neighbourhood where it once was common but from which it has in recent years disappeared. Would any Fellow of the Society living in a district where the lizard is abundant be so very kind as to catch half

a dozen or so, and send them by post in a tin box *with air holes*, addressed Rev. W. Wilks, Shirley Vicarage, Croydon? The box must not be wrapped in paper, or the inhabitants will get no air and die. It should have a little grass and a few sprays of heather inside, and be simply tied round tightly with string and several *small* holes made in each side for air to enter freely. Mr. Wilks will be vastly grateful to any sender, and will give the little strangers a hearty welcome and introduce them to a gloriously sunny bank with rough stones to lie under and plenty of heather and gorse near by, with flies and beetles in abundance and no children to break off their tails.

38. MS. FOR JOURNAL.

The Editor is always glad to receive suitable articles for issue in the JOURNAL from corresponding and other Fellows of the Society. It is thought that much more might be done in this direction to disseminate valuable botanical and horticultural information, and to publish records of work and research conducted by other than actual official members of the Society. The JOURNAL is received by the best libraries in the world, and is regularly sent to all the 12,000 Fellows of the Society.

39. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

RHODODENDRON SHOW (May 30th to June 2nd).—This Show at the Hall is not entered on Fellows' Tickets, having been arranged since they were printed. Will Fellows please enter it for themselves and make a memorandum of it.

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